

### III. REVIEW OF HISTORICAL BYCATCH STUDIES IN GALVESTON BAY

Historical information on bycatch in Galveston Bay is limited to several studies conducted during the 1980's. Matlock (1982) conducted a study of flounder bycatch from bay commercial and bait shrimpers. Lamkin (1984) monitored shrimp and bycatch on a single bait shrimp vessel in lower Galveston and West Bays over an eight month period. Bessette (1985) conducted a similar study on six bait shrimp vessels throughout the Galveston Bay system. Of the three studies, the bycatch data collected by Bessette (1985) is more extensive and recent. Additionally, some of the data collected by Bessette (1985) was available to us for review and analysis. Consequently, this historical review primarily focuses on the results of the Bessette (1985) study which are presented first. The Matlock (1982) study was limited to several species of flounder and is therefore discussed last in this review.

### METHODS

#### *Bessette Study*

Bessette (1985) accompanied six commercial Galveston Bay bait fishermen during May through November 1984. Each shrimper fished one of the major subdivisions of Galveston Bay defined in 1956 by the NMFS Statistical Office. Thus, she evaluated bycatch from six sites (Trinity Bay, Upper and Lower Galveston Bays, East Bay and two areas within West Bay; Figure 1), during the prime bait shrimping season. The fishery-dependent sampling design required biweekly sampling of each area, but weather and economics (demand for bait, etc.) sometimes hindered data collection. Bessette recorded total catch weight, shrimp weight, bycatch weight and duration (minutes) for each tow. Environmental data such as water temperature and salinity were recorded every third tow. To eliminate effects of variability in tow duration, catch per unit effort (CPUE, kg/hr) for shrimp, finfish and invertebrate catch was calculated on a per tow basis. Bessette also evaluated species composition of the bycatch, taking a random 4.5 kg subsample for species identification about every third tow. Samples from 107 of the total 355 tows were available for species identification. Total number of tows for species identifications in each bay area varied between 16 and 21. All surveyed shrimpers used some type of otter trawl; a fisherman who fished in the West Bay area, used a 'bottomless' otter trawl net (described later). Finfish:shrimp ratios were later computed from the original data, transformed to natural logs, and analyzed by either contrast comparison between sampling areas using general linear model (GLM) procedures or by simple linear regression between some of the variables (SAS Institute 1985; Zein-Eldin and Bessette, in prep).

### ***Lamkin Study***

Lamkin (1984) limited his year-long investigation (July-December 1981, May-June 1982) to a single bait shrimper who fished only the eastern portion of West Bay, Offats Bayou, and, to a very limited extent, Lower Galveston Bay. Lamkin details the fishing gear (which includes a 'bottomless net') and fishing procedures without explicitly stating either sampling frequency or sampling design. However, the study was necessarily fishery dependent. Lamkin's data (Table 1) imply he accompanied the shrimper on 34 days; 28 between July 4 and December 31, 1981, and an additional 6 days between May and June 1982. Shrimp catch (both table shrimp and smaller bait shrimp) was estimated in quarts for each trawl on a sampling day. Total incidental catch from at least one trawl per day was weighed, preserved for later specific identification, and the ratio of shrimp:finfish was calculated (not finfish:shrimp as in Zein-Eldin and Bessette, in prep.). A total of 62 trawls was included in this portion of the research. Ratios were transformed (natural logs), and a monthly mean ratio with 95% confidence limits was calculated. A similar procedure was followed for shrimp:invertebrate ratios; only 55 trawls were included (perhaps because of the absence of invertebrates from some samples, but this is not stated). It appears biomass of shrimp and bycatch from the 62 special samples were totaled to derive the monthly percentage of total catch attributable to bycatch (Table 2).

The fisherman's monthly shrimp catch, days fished, and mean catch (kg/hr) were obtained from log books submitted to the NMFS bait shrimp program. Baywide bait catch and effort data were obtained from the NMFS Galveston Laboratory.

Lamkin detailed monthly bycatch, both in number and biomass for dominant species. The study also provided standard length frequency data for Atlantic croaker, sand seatrout, and spot, as well as carapace widths for blue crab, but these data were not discussed.

### ***Matlock Study***

One randomly selected commercial shrimp trawler was accompanied one day each month from April through November 1978 in some area of Galveston Bay (Matlock 1982; Table 3). All flatfish were identified to species, and southern and gulf flounder were counted and measured (TL). Number of drags and tow duration were recorded. Mean catch rate (number/hr) was calculated for each month for the Galveston Bay system.

## **RESULTS AND DISCUSSION**

### ***Bessette Study***

Hydrology: A salinity gradient was observed from Trinity Bay through the eastern portion of West Bay (Figure 2). Salinities, ranging from <1 to 30 ppt, followed similar seasonal patterns within all bay areas. Values were lower in May and June,

increased in July, August, and September, and decreased in early October. Mean salinity varied significantly ( $p > 0.0001$ ) among bay areas. The highest mean salinity (24.2 ppt) was recorded in eastern West Bay, the lowest (11.3 ppt) in Trinity Bay. No values above 17.0 ppt were recorded in Trinity Bay and salinities less than 1 ppt were observed in November 1984, a month in which mean salinity at the Galveston Pleasure Pier was about 12 ppt (17 ppt below the monthly long-term average; Pechmann et al. 1985). Surface water temperatures ranged from 14.0° C in November to 32.6° C in June, reflecting typical seasonal patterns. Over 75% of the tows were made at temperatures between 25.3 and 30.4° C, with temperatures above 30° C in each of the summer months (June-August). Water temperature decreased below 23° C in early November and was less than 20° C for the remainder of the sampling period.

**Bycatch:** Over the 355 tows and 221.5 hours of shrimping effort, bycatch weight averaged 65% (2.9 % to 98.8% in individual tows) of the total catch per tow, with mean baywide bycatch CPUE of  $35.3 \pm 35.80$  (SD) kg/hr and mean shrimp catch of  $15.3 \pm 21.48$  kg/hr. Baywide ratios (based on weight) of bycatch:shrimp averaged  $4.1 \pm 7.0$ . West Bay, near the Galveston causeway, was a notable exception (Figure 3). In West Bay, mean bycatch was significantly less than that of all other sampled areas combined, both as percent of total catch (mean  $31.1 \pm 23.8$  % vs.  $70.6 \pm 16.8$  %) and as CPUE (mean CPUE  $14.7 \pm 9.9$  kg /hr vs.  $35.3 \pm 35.80$  kg/hr). Finfish:shrimp ratio of one West Bay fisherman was  $0.9 \pm 2.02$  (Zein-Eldin and Bessette, in prep.). Data from this fisherman will be discussed separately in a later section and compared to data of Lamkin (from the same individual and fishing area).

Bessette identified 66 fish and 8 invertebrate species from the 37,166 individuals collected in the random samples of bycatch (Table 4). Of the 66 fish species, 8 were present in more than half the sampled tows. Only Atlantic croaker was present in all 107 tows (about one-third of all tows completed). Spot were present in 105 tows, gulf menhaden in 99 tows, sand seatrout in 92 tows, least puffer in 63 tows, pinfish in 61 tows, threadfin shad in 58 tows, and bay whiff in 57 tows; 11 other species were identified in only one tow.

Six species comprised 75%, by number, of the specimens collected (Table 5). Atlantic croaker represented 27%, gulf menhaden 23%, spot 14%, sand seatrout 4%, bay anchovy 4%, and hardhead catfish 3%.

Bay-wide, the most abundant species (by weight) was Atlantic croaker, comprising 27% of the bycatch; gulf menhaden accounted for 21% and spot 13% of total biomass. Sand seatrout, cutlassfish, striped mullet, threadfin shad, hardhead catfish and pinfish accounted for 15% of the total biomass. Thus, 9 of the 66 species comprised 76% of bycatch biomass during late May through mid-November.

Species abundance varied somewhat between bay areas (Table 6). In Trinity Bay, 33 finfish species were taken in the bycatch. Atlantic croaker was the dominant species in both number of individuals (35%) and biomass (43%); greatest catches came during June through August (Figure 4). It should be noted that CPUE values reported for the Bessette study were calculated only from the tows in which individual species occurred and not from the total number of tows sampled. Other species with

high CPUE during certain months included southern flounder (August) and gulf menhaden (November).

A total of 34 species was found in the bycatch in Upper Galveston Bay. Atlantic croaker was the dominant species in both number (39%) and biomass (54%). This species was also taken most frequently during June through August (Figure 5). Other finfish species with high CPUE during certain months included gulf menhaden (increasing from June through September) and hardhead catfish (August and September).

In West Bay, 31 species were found in the bycatch, with Atlantic croaker dominant species in both number (40%) and biomass (31%). Greatest catch rates for this species occurred during June through August (Figure 6). Gulf menhaden CPUE was greatest in June, cutlassfish in May, and gafftopsail catfish during August.

In Lower Galveston Bay, 58 species were found in the bycatch. Atlantic croaker were dominant species in number caught (21%), but most of the biomass was attributable to gulf menhaden (25%). Atlantic croaker was most common during May through August, with gulf menhaden common during July (Figure 7).

In East Bay a total of 42 species was found in the bycatch, with gulf menhaden dominant in number (29%) and biomass (43%). Greatest CPUE for gulf menhaden occurred from July through October (Figure 8). In the "far" West Bay and Chocolate Bay area, 39 species were found in the bycatch. Spot was dominant in both number (25%) and biomass (30%). Spot was most common during most months sampled; Atlantic croaker was common from May through August and gulf menhaden common in May and July through September (Figure 9).

Atlantic croaker was the most abundant fish in both number and weight in three of the six major areas (Trinity Bay, West Bay and Upper Galveston Bay), and by number in 4 of the 6 major areas (Trinity Bay, Lower Galveston Bay, West Bay and Upper Galveston Bay). In East bay, gulf menhaden was the most abundant species in both number and weight. Spot was the most important species in both categories in "far" West Bay and Chocolate Bay. Hardhead catfish were relatively abundant only in Upper Galveston Bay where they constituted more than 13% of the number and 8% of the weight.

No two areas had the same fish species composition. Greatest variety (58) was observed in Lower Galveston Bay. Conversely, only 33 fish species were identified from Trinity Bay and 34 species from Upper Galveston Bay. Greatest biomass of bycatch species occurred in Lower Galveston Bay.

With the exception of gulf menhaden, Atlantic croaker and sand seatrout, species of special interest or commercial value were usually found at very low levels during the study. Although gulf butterfish (*Peprilus burti*) were observed in all months except July in West Bay, Lower Galveston and East Bays, abundance levels were moderate in all three areas. Black drum occurred only in September and October. Southern flounder was recorded in 28 of 107 tows, occurring in at least one tow each month. However, there appeared to be substantial differences in distribution of southern

flounder within bay areas. Both the largest number and highest biomass of southern flounder were found in Trinity Bay (Table 6).

Eight species of invertebrates were present in the bycatch (7 crustaceans and 1 mollusk; Table 7). Blue crab (present in 56 of 107 tows) and Atlantic brief squid (present in 47 tows) were caught in every sampling month. Blue crab were taken from every area, and Atlantic brief squid from all areas except Trinity Bay. Lesser rock shrimp, mantis shrimp, lesser blue crab, and a shrimp reported as *Crangon normanni* (probably *Alpheus normanni*, Green Snapping Shrimp; Williams et al. 1988) were recorded only during October and November. Iridescent swimming crab occurred as early as August, but was more frequent during October and November.

Blue crab CPUE was highest during June (18.8 kg/hr), followed by July (3.8 kg/hr) and October (3.2 kg/hr). Blue crab catches from Trinity Bay exceeded those for the other areas (16 of 20 tows sampled for bycatch species, and 6.8 kg/hr). Only in Lower Galveston Bay were blue crabs nearly as frequent (16 of 21 tows), but mean CPUE was only 3.1 kg/hr. A blue crab CPUE of 3.6 kg/hr was reported from Upper Galveston Bay (sampled only through September).

Atlantic brief squid, unlike blue crabs, were never reported from the Trinity Bay area. Squid catches were most frequent in West Bay and Lower Galveston Bay, with mean CPUE maximum in Lower Galveston Bay (2.1 kg/hr).

West Bay: As previously indicated, catch ratio of bycatch to shrimp, bycatch percentage, and bycatch abundance (CPUE) from this shrimper were significantly less than those of shrimpers in all other areas (Figures 3, 10 and 11). In only one month (September) did the bycatch ratio approach that reported by shrimpers in other areas. However, his average shrimp catch ( $22.0 \pm 21.5$  kg/hr) was not significantly less than that of other bait shrimpers during the same period ( $14.4 \pm 21.3$  kg/hr; Figure 12). In fact, it was second only to that of the shrimper who worked farther west in West Bay and Chocolate Bayou. It is of interest that the West Bay fisherman's tow times were longer than those of most other shrimpers during the same months (Figure 13). Thus, his lower bycatch resulted either from real differences in bycatch distribution in the bay areas in which he fished, or his shrimping techniques, including his gear, provided a cleaner shrimp catch despite longer tow times.

### ***Lamkin Study***

Lamkin accompanied one fisherman in West Bay between July 1981 and June 1982. As in the Bessette study, bycatch was relatively low, both for total bycatch weight and ratio of bycatch:shrimp. Monthly fish:shrimp mean ratios ranged from 0.16 in July to 0.7 in December (values converted from those originally expressed as shrimp:fish) (Table 8). Monthly bycatch ranged from 16.9 to 42.4% of each monthly yield, with an average of 27.2% of total catch (Table 2). Lamkin identified 52 species of finfish and 4 invertebrates as compared with 30 fish and 3 invertebrate species in this area listed by Bessette.

During Lamkin's study, the five most numerous species and their percentage's of total bycatch were Atlantic croaker (31.2%), sand seatrout (16.2%), blue crab (9.7%), spot (9.5%), and gulf menhaden (4.3%). In terms of biomass, Atlantic croaker were dominant (24.8%), followed by blue crab (21.4%), sand seatrout (8.1%), spot (7.2%) and gulf menhaden (3.5%).

Atlantic croaker were numerically abundant in all months from May through September (Figures 14 - 17). Croaker accounted for 17.5% of the bycatch in July, increased to 20% in August, then gradually declined to under 4% in December. During the next season, May and June were months of peak abundance, accounting for 65.7% and 46.8% of the bycatch, respectively.

Sand seatrout were numerous in bycatch from July through December (Figures 14-17). However, even though this species was important in total numbers, sand seatrout contributed little to total biomass of the catch. In July, sand seatrout constituted 21.4% of the catch by number, but only 4% of the biomass (Figure 14). In September the biomass increased to 12%, but did not increase above this value until December when sand seatrout represented 52% of the individuals and 28% of the weight (Figures 16 and 17).

Overall, in the bycatch, blue crab were the third most numerous species. However, they accounted for 92% of the invertebrate bycatch biomass. Blue crabs were common throughout the year, except during December (Figures 14-17). Catch peaked in July 1981 (12.5%) and May 1982 (21.7%).

Spot were present in the bycatch throughout the sampling period (Figures 14-17). Yet it was an important part of the biomass only in July (17.5%), November (9%), and June (19%). In each of the other months, spot accounted for less than 6% of the bycatch.

Gulf menhaden was the fifth most numerous species in the bycatch. Gulf menhaden were taken in trawls during all months, but were most abundant during June through December (Figures 14-17). November was the greatest month in terms of total number (11%), whereas December was the peak month for biomass (15%).

In his report, Lamkin compared shrimp catch by this West Bay fisherman to other bait shrimpers (as reported by NMFS). He estimated this West Bay fisherman's shrimp CPUE (a peak 26.5 kg/hr) was about 50% less than that of other bay bait shrimpers. This contrasts with the equal or slightly improved CPUE by this fisherman determined in direct comparison with shrimpers in other bay areas (Zein-Eldin and Bessette, in prep.). Lamkin's statistical methods are not detailed and his raw data are not available for analysis. However, it may be possible Lamkin compared the NMFS monthly reports of catch (lb) and effort (hr) with the West Bay fisherman's figures in kg/hr (1 kg=2.2 lb), perhaps explaining the 50% difference in shrimp CPUE. Lamkin further projected total bay bycatch based upon monthly shrimp:fish ratios (expressed in this review as fish:shrimp ratios) he had calculated from his samples. Extrapolating these very low ratios to the estimated Galveston Bay bait production, he concluded that fish bycatch was minimal for all Galveston Bay bait shrimpers.

### ***Matlock Study***

This study was limited to gulf flounder and southern flounder catch associated with Texas bay shrimp trawling; numeric abundance's were determined . Total flounder catch by commercial bay shrimpers was estimated based on coast-wide catches and total numbers of Texas bay shrimping licenses. Table 3 presents monthly numeric catch of southern flounder and the various areas of Galveston Bay that were sampled. Southern flounder bycatch in Galveston Bay was less than that for any other Texas bay system except Upper Laguna Madre. There were no catches of gulf flounder in Galveston Bay, although other flatfishes, including bay whiff, hogchoker, blackcheek tonguefish, lined sole and ocellated flounder were all present at some time during the sampling period.

### **SUMMARY**

1. Only three projects have directly assessed shrimp trawl bycatch in Galveston Bay. Matlock (1982) conducted a TPWD study of the flounder bycatch from bay commercial and bait shrimpers throughout the state. Lamkin (1984) monitored shrimp and bycatch on a single bait shrimp vessel periodically for eight months. Bessette (1985) conducted a similar study using six bait shrimpers throughout the Galveston Bay system for seven months.
2. Baywide bycatch averaged about 65% of the total catch by weight during the Bessette study.
3. Baywide bycatch CPUE averaged about 35.3 kg/hr, with an average shrimp harvest of 15.3 kg/hr during the Bessette study.
4. Atlantic croaker was the dominant (number) bycatch species in 4 of the 6 major areas (Trinity Bay, Lower Galveston Bay, West Bay and Upper Galveston Bay), with gulf menhaden dominant in East Bay and spot dominant in "far" West Bay and Chocolate Bay.
5. Atlantic croaker was the dominant (biomass) bycatch species in 3 of the 6 major areas (Trinity Bay, West Bay and Upper Galveston Bay), with gulf menhaden dominant in 2 of the other areas (East Bay and Lower Galveston Bay), and spot dominant in the last area ("far" West Bay and Chocolate Bay).
6. Some important special interest species such as southern flounder, red drum and spotted seatrout occurred infrequently in the sampled trawls.

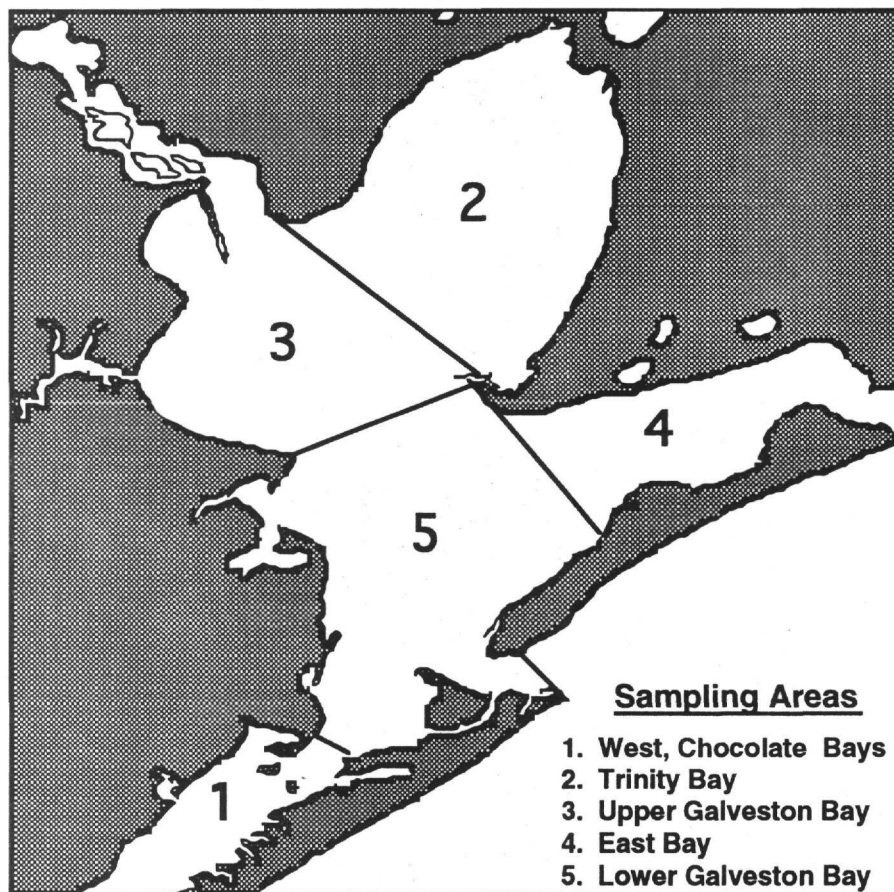


Figure 1. Galveston Bay bait shrimping areas sampled by Bessette (1985).

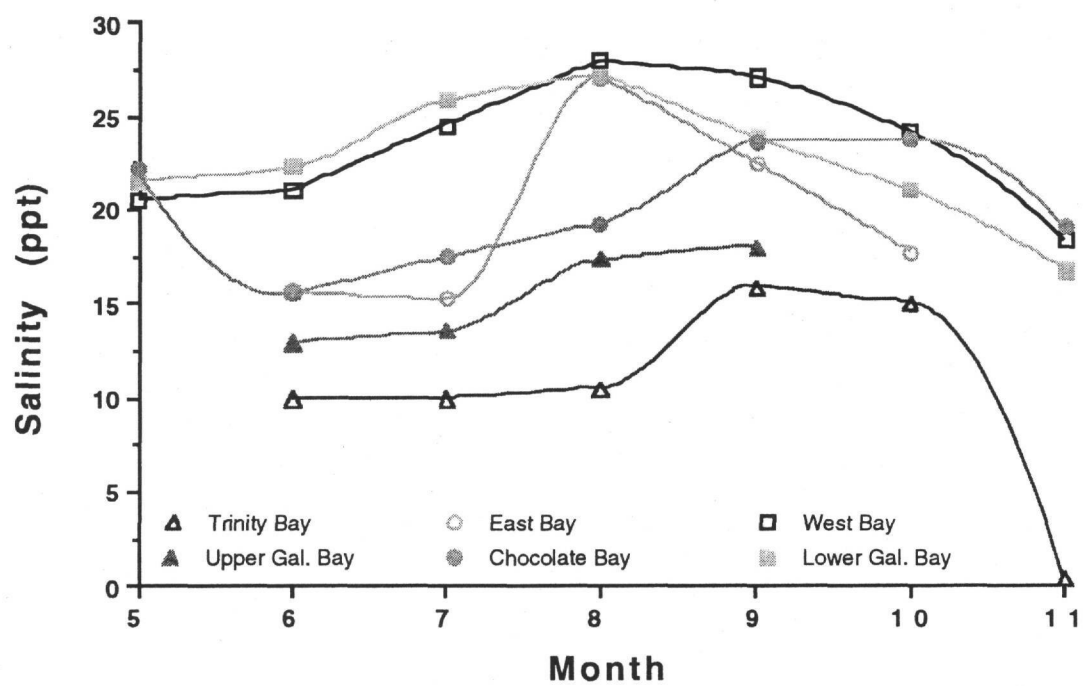


Figure 2. Mean salinities in Galveston Bay during 1984 sampling period (data from Bessette 1985.)

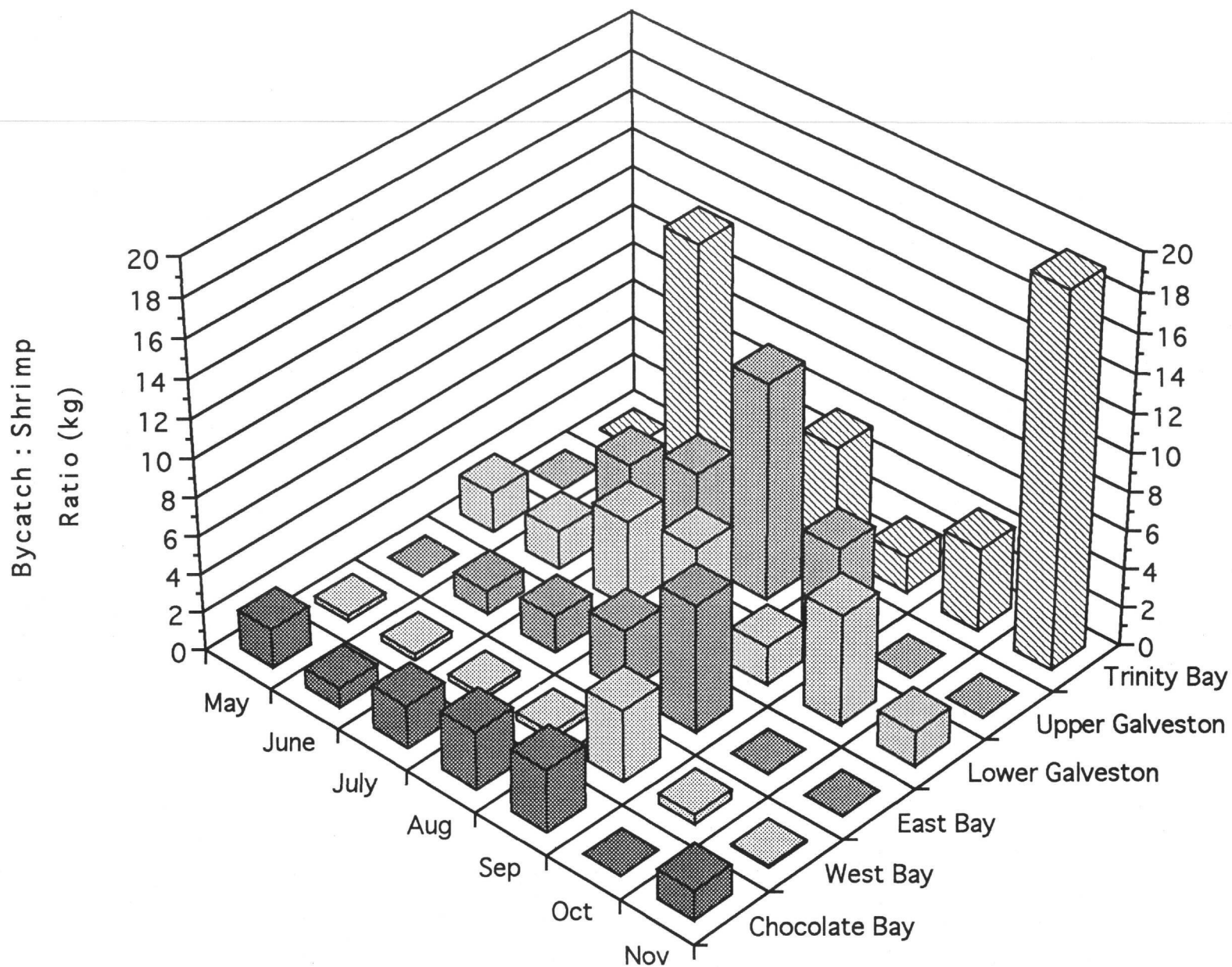


Figure 3. Mean bycatch : shrimp ratio by area and month (data from Bessette, 1985).

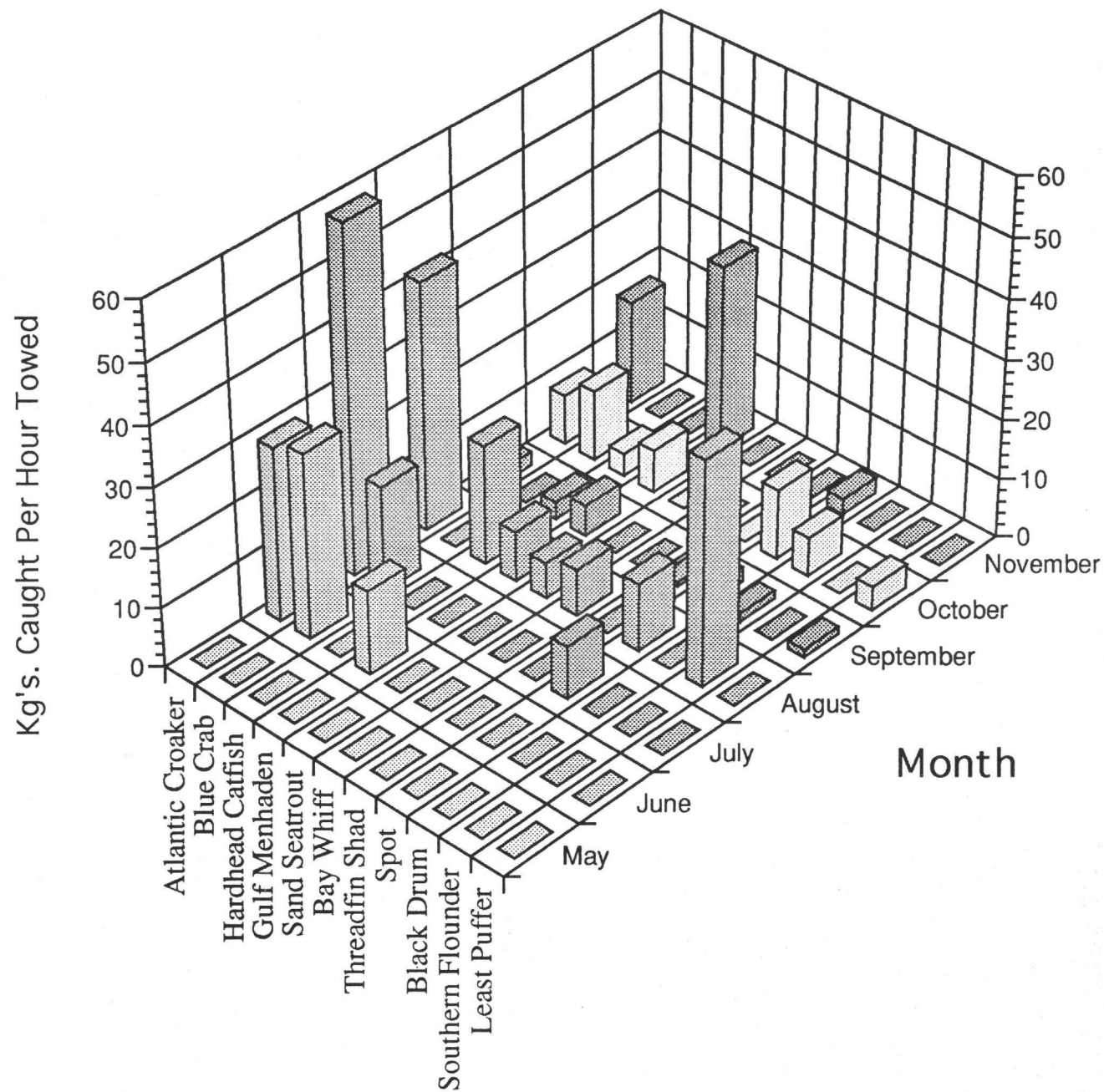


Figure 4. Monthly CPUE of dominant bycatch species caught in Trinity Bay (data from Bessette, 1985).

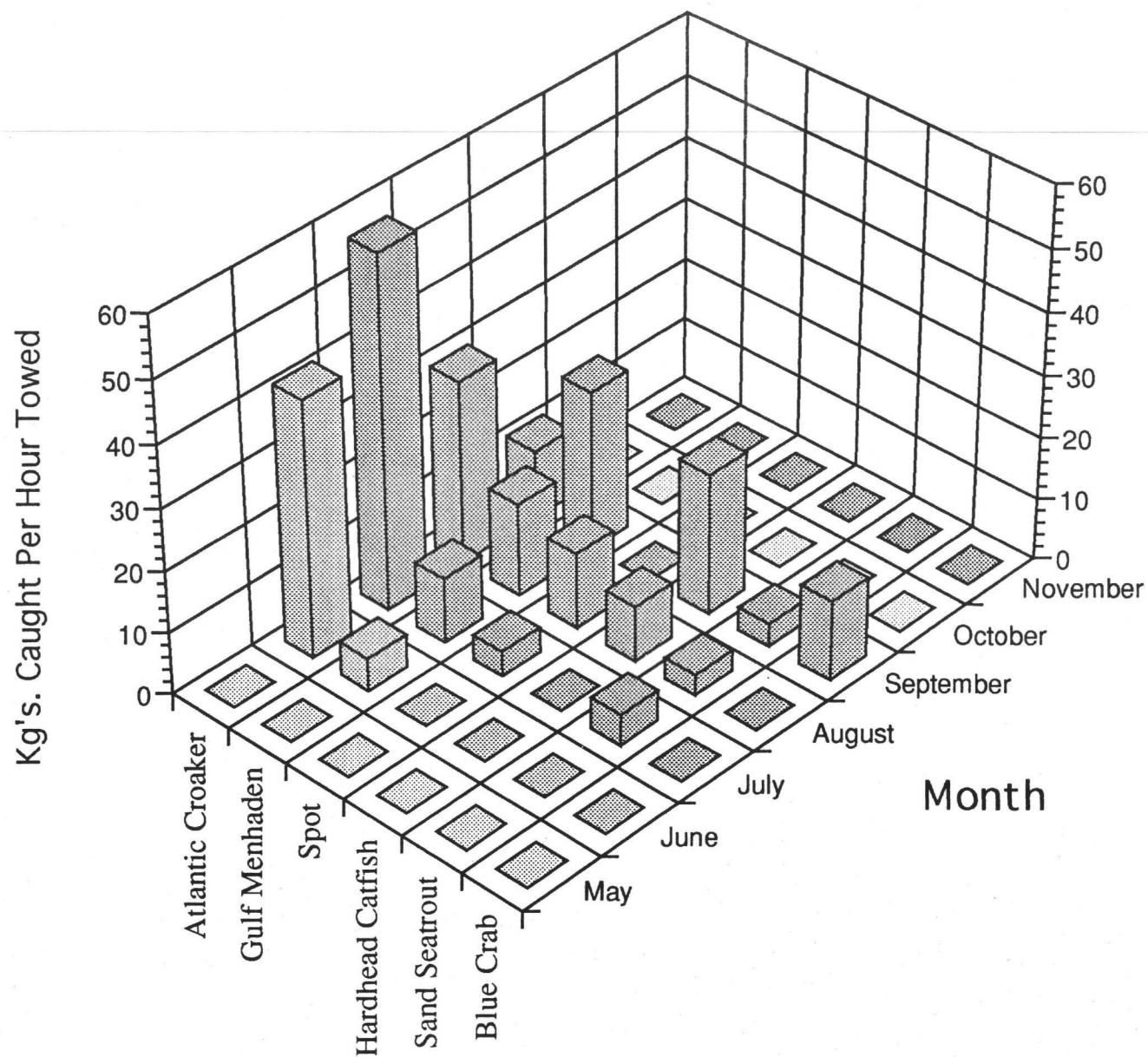


Figure 5. Monthly CPUE of dominant bycatch species in upper Galveston Bay (data from Bessette, 1985).

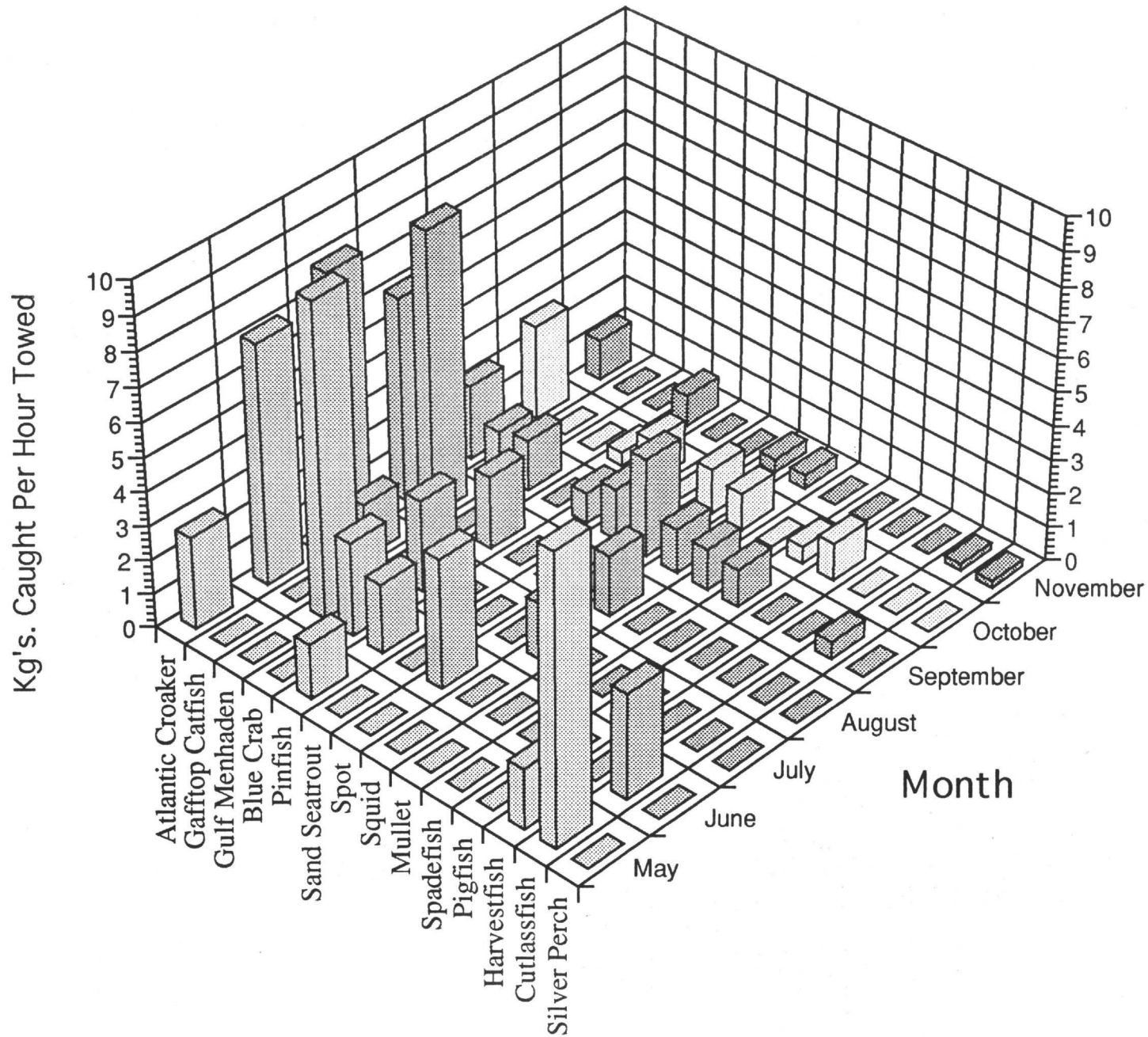


Figure 6. Monthly CPUE of dominant bycatch species in west Galveston Bay (data from Bessette, 1985).

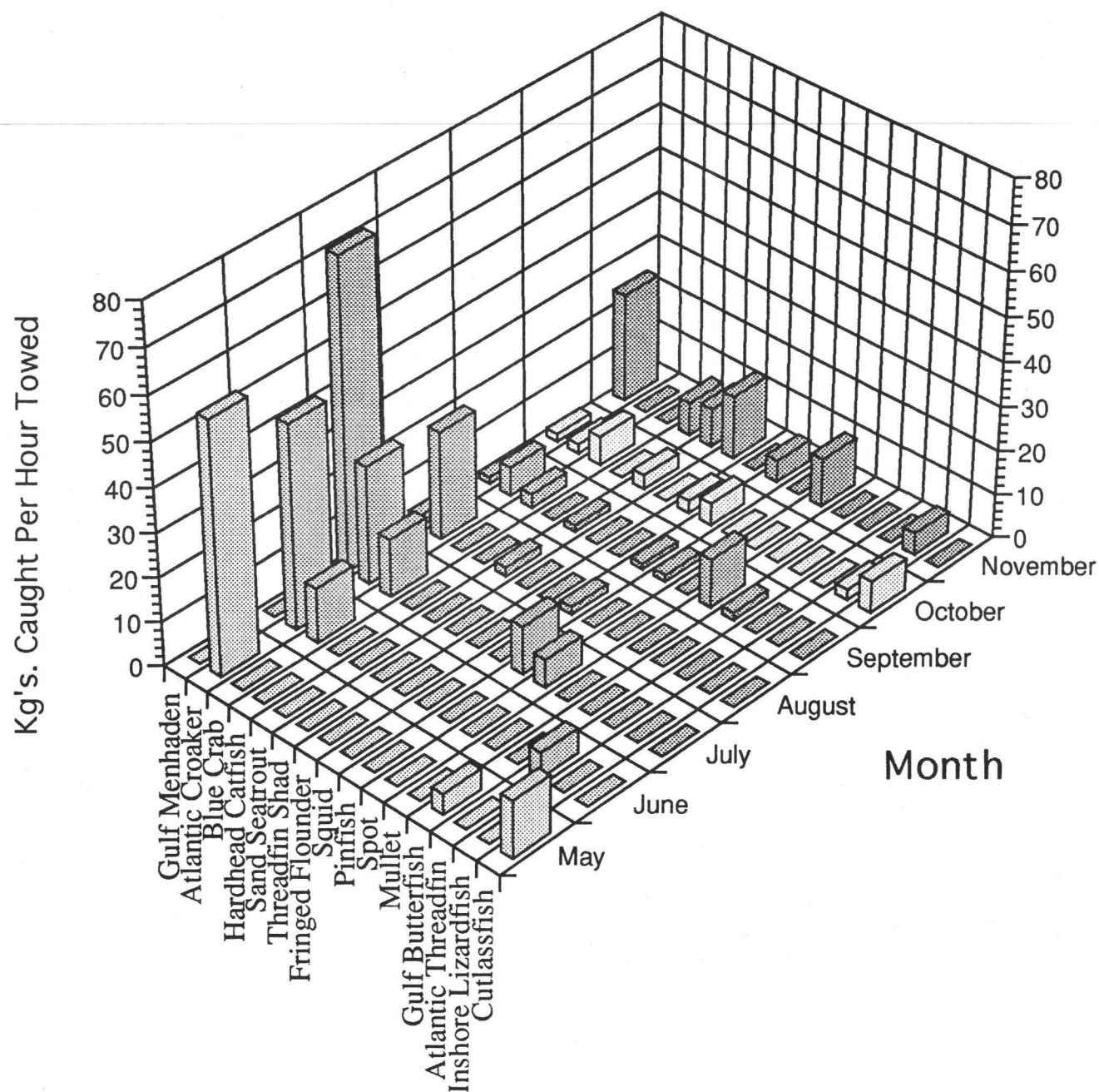
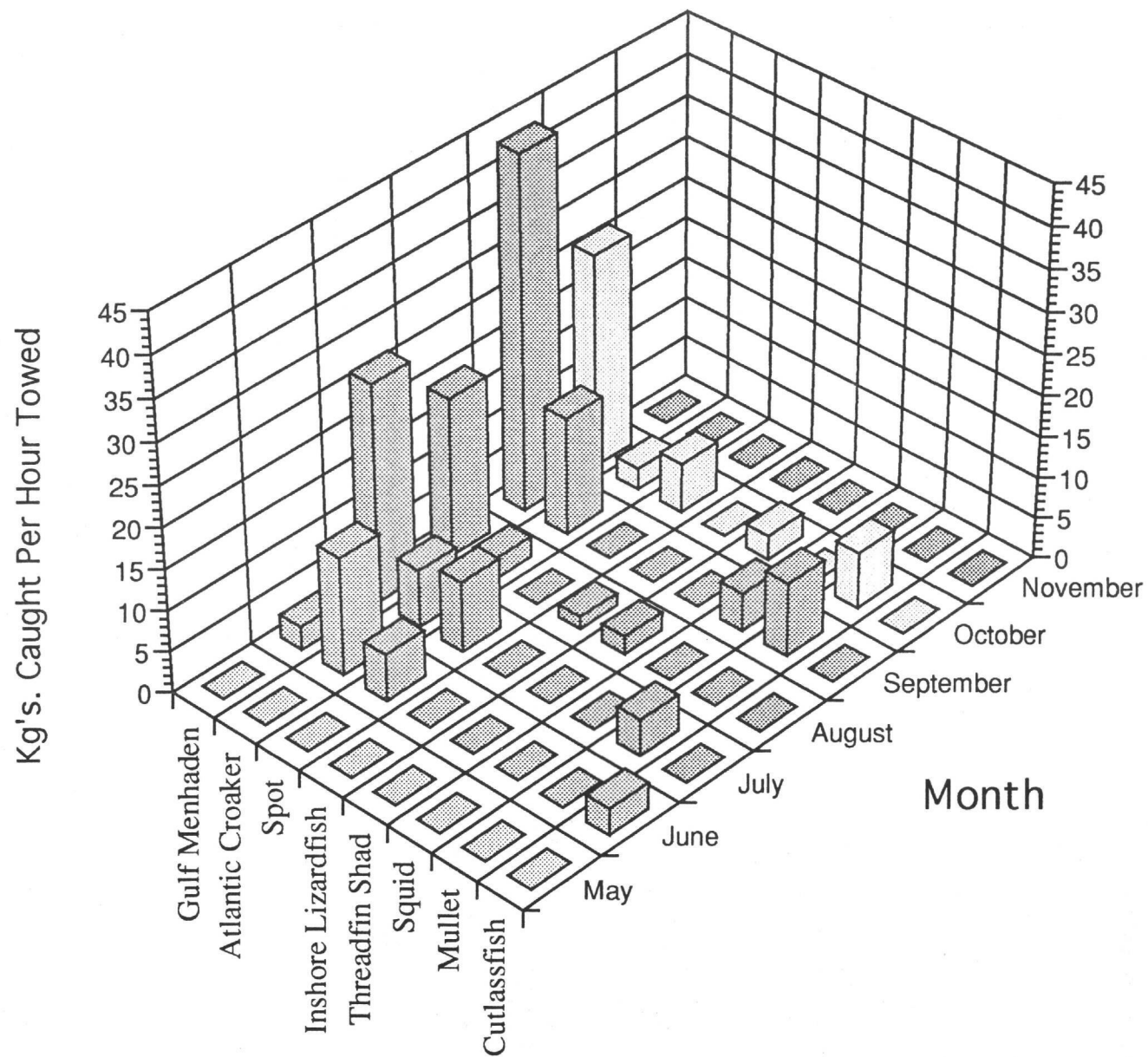


Figure 7. Monthly CPUE of dominant bycatch species in lower Galveston Bay (data from Bessette, 1985).



**Figure 8. Monthly CPUE of dominant bycatch species in East Bay (data from Bessette, 1985).**

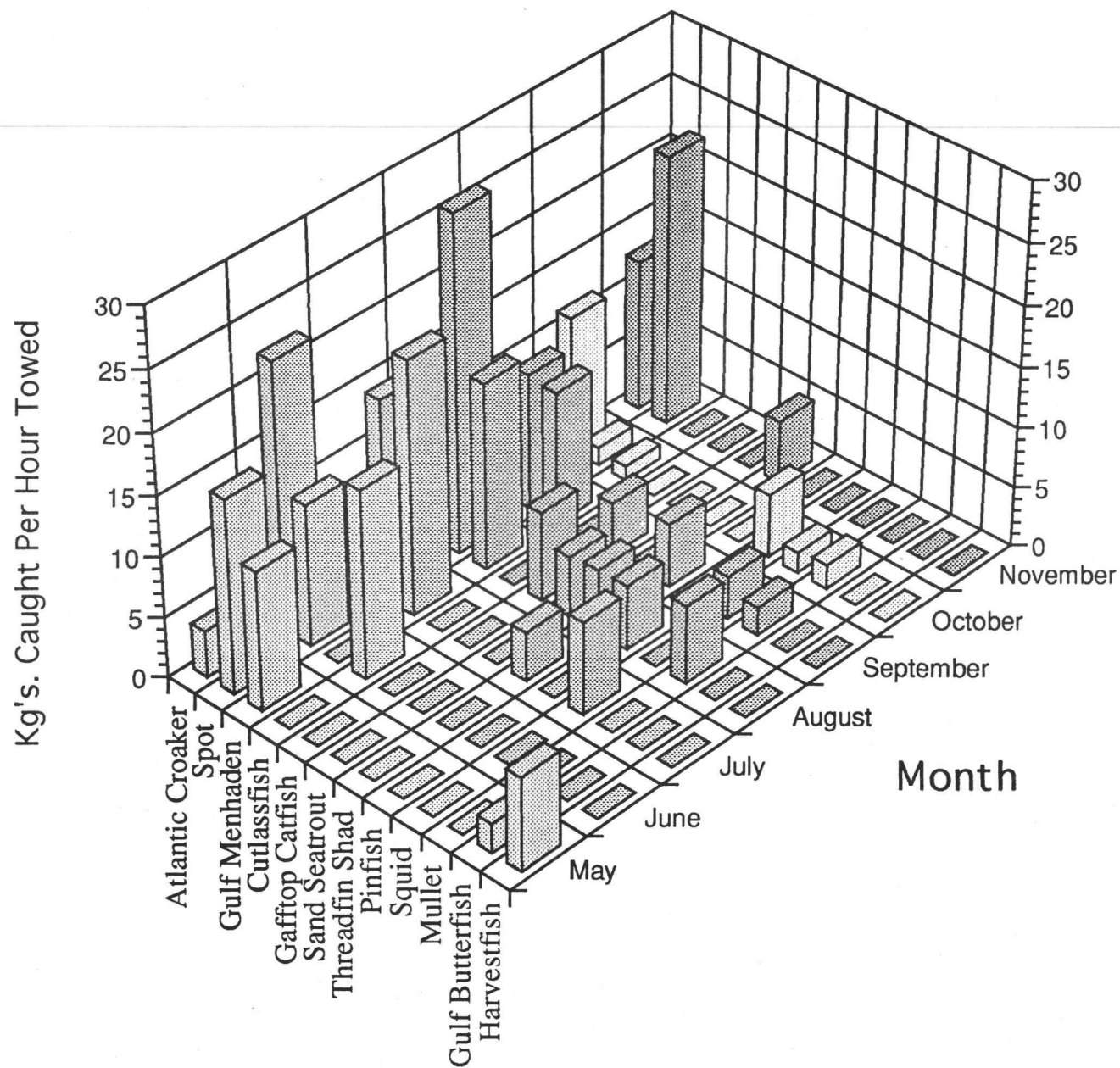


Figure 9. Monthly CPUE of dominant bycatch species in Chocolate Bay (data from Bessette, 1985).

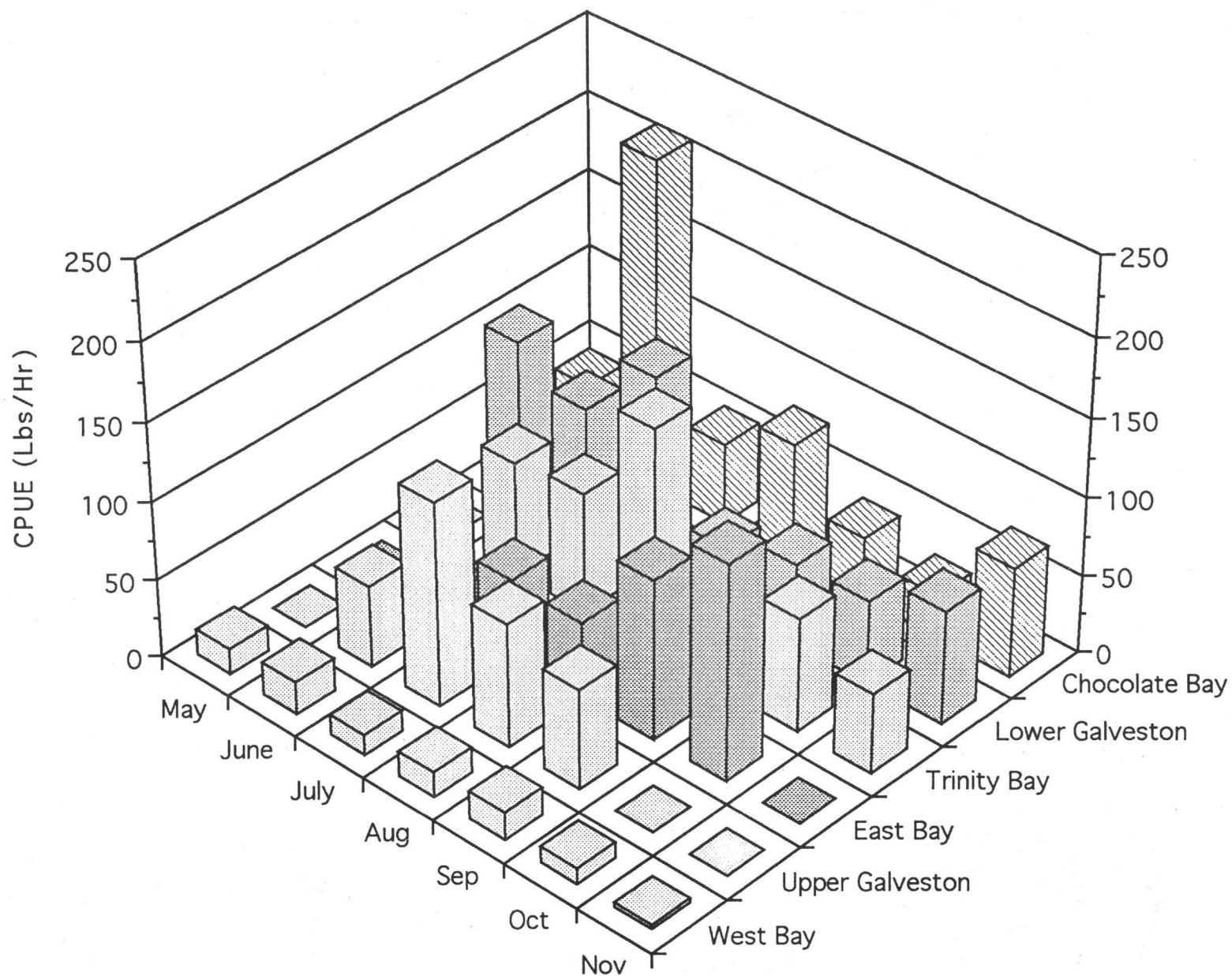


Figure10. Bycatch CPUE in Galveston Bay by area and month (data from Bessette, 1985).

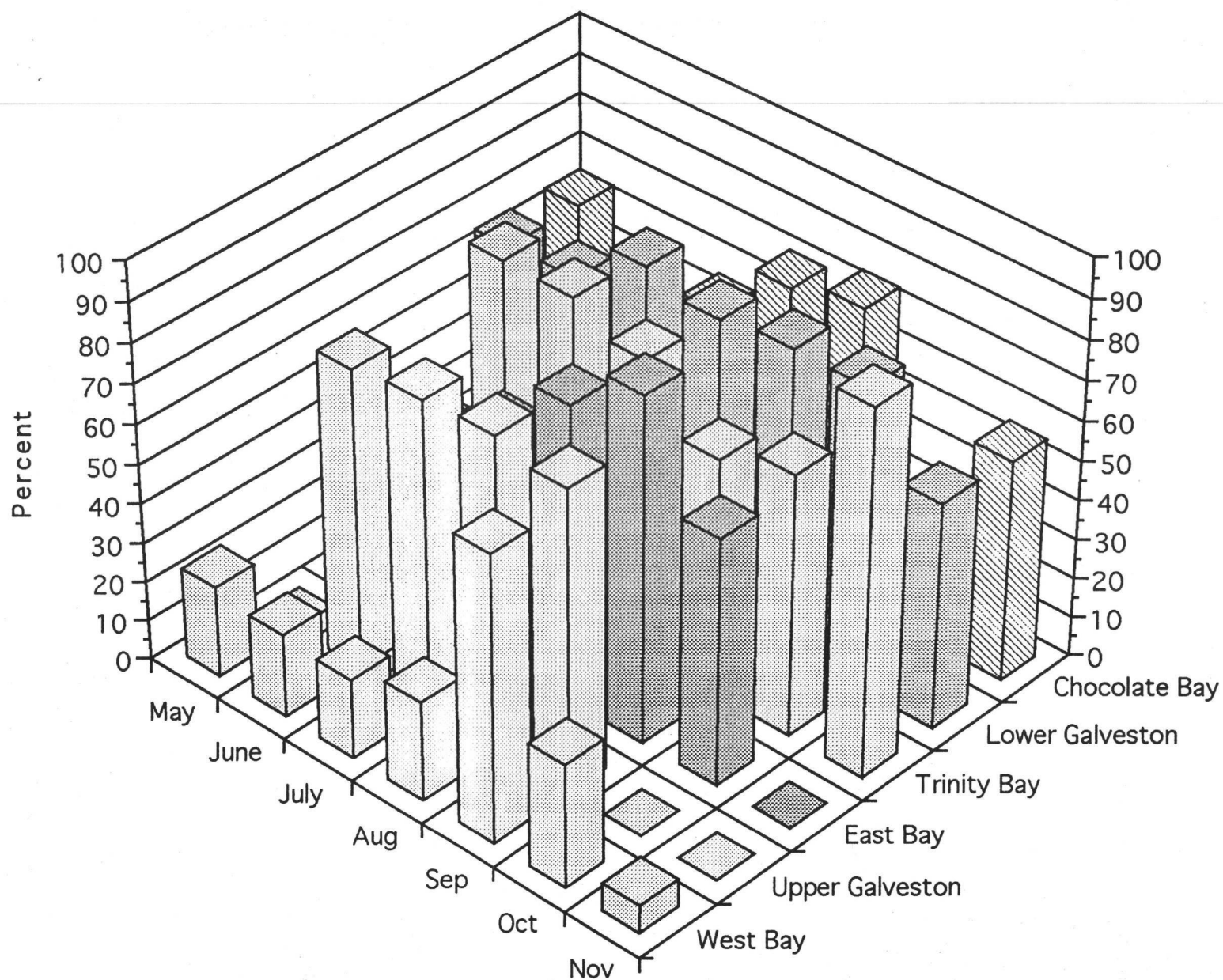
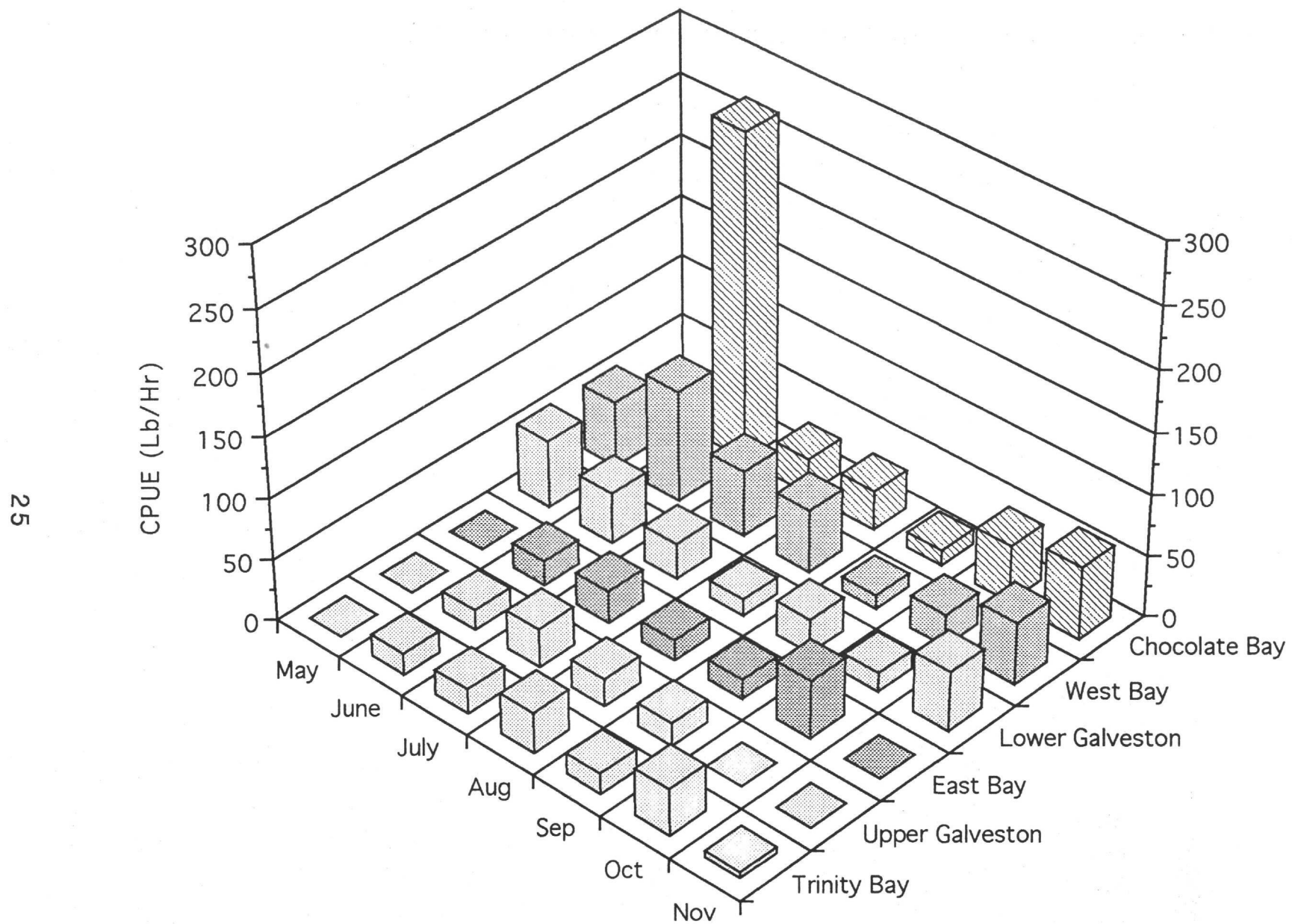
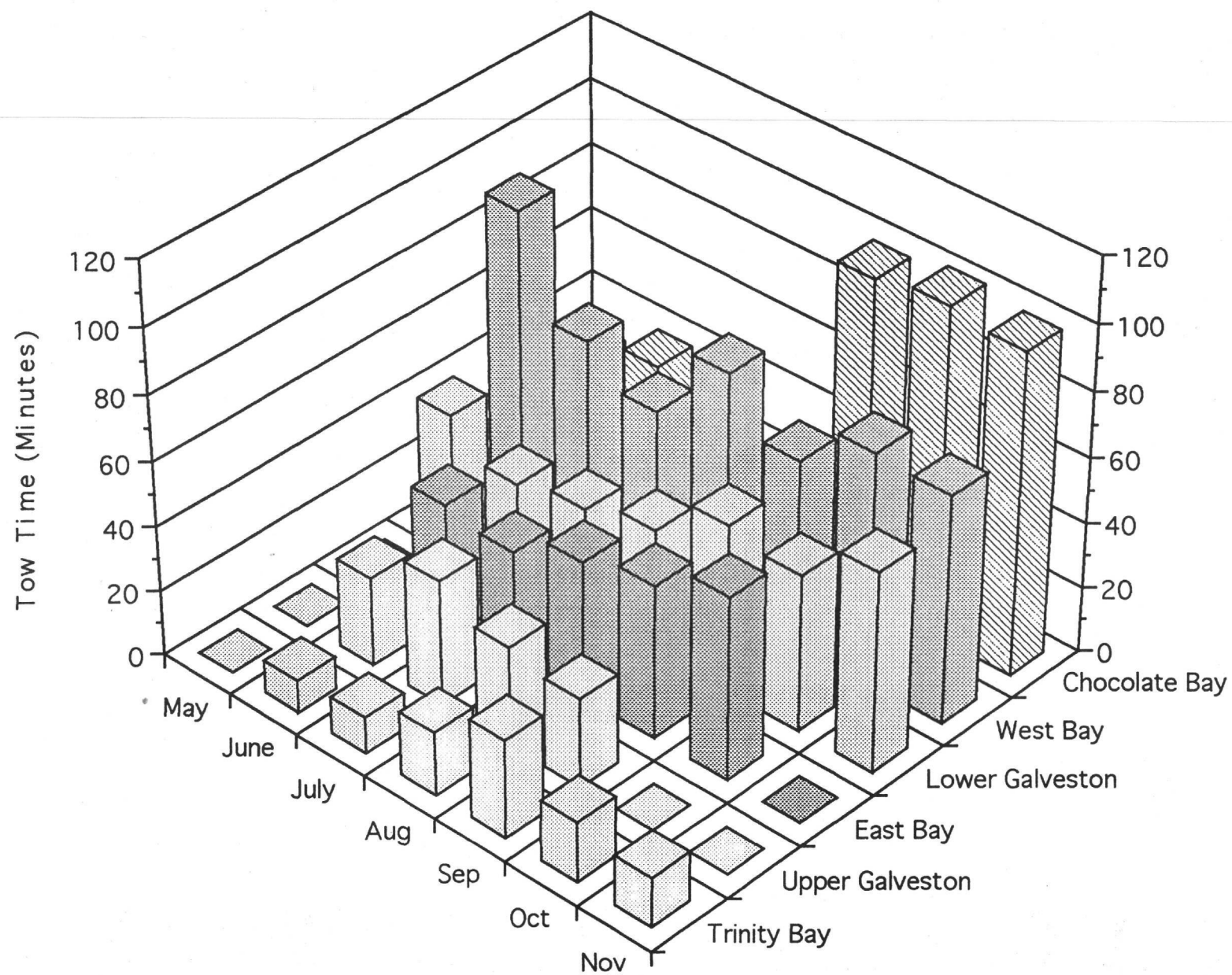


Figure 11. Bycatch as percent of total catch weight in Galveston Bay (data from Bessette, 1985).

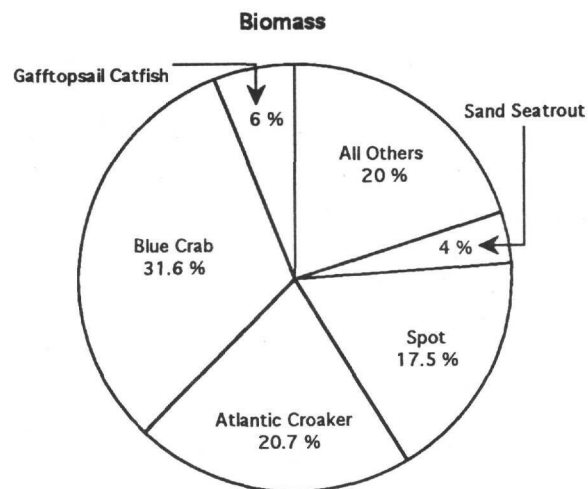
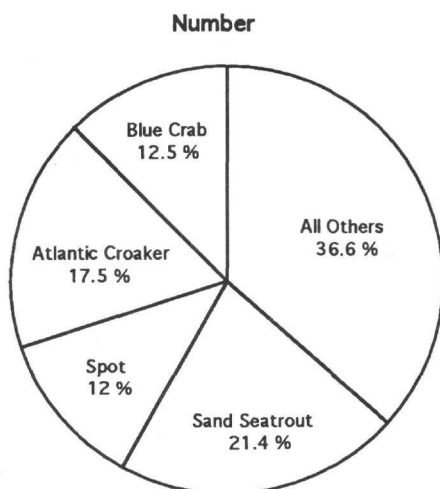


**Figure 12. Shrimp CPUE in Galveston Bay by area and month (data from Bessette, 1985).**



**Figure 13. Mean tow duration by area and month (data from Bessette, 1985).**

July 1981



August 1981

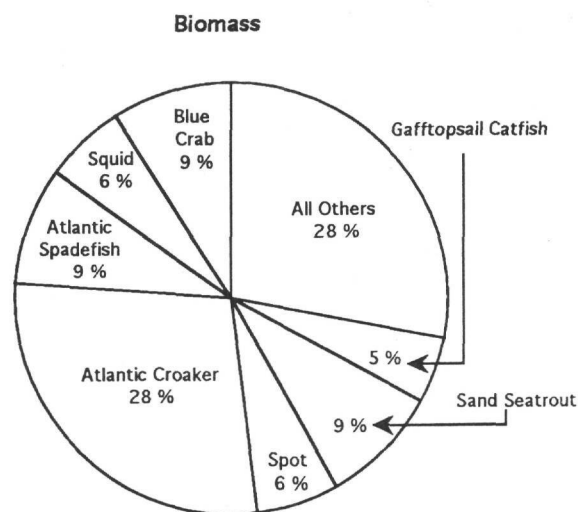
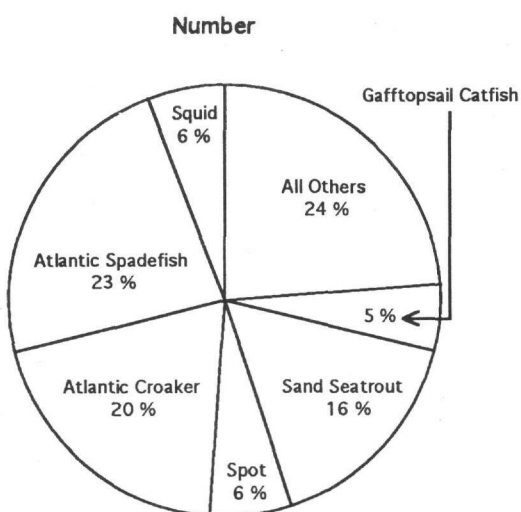
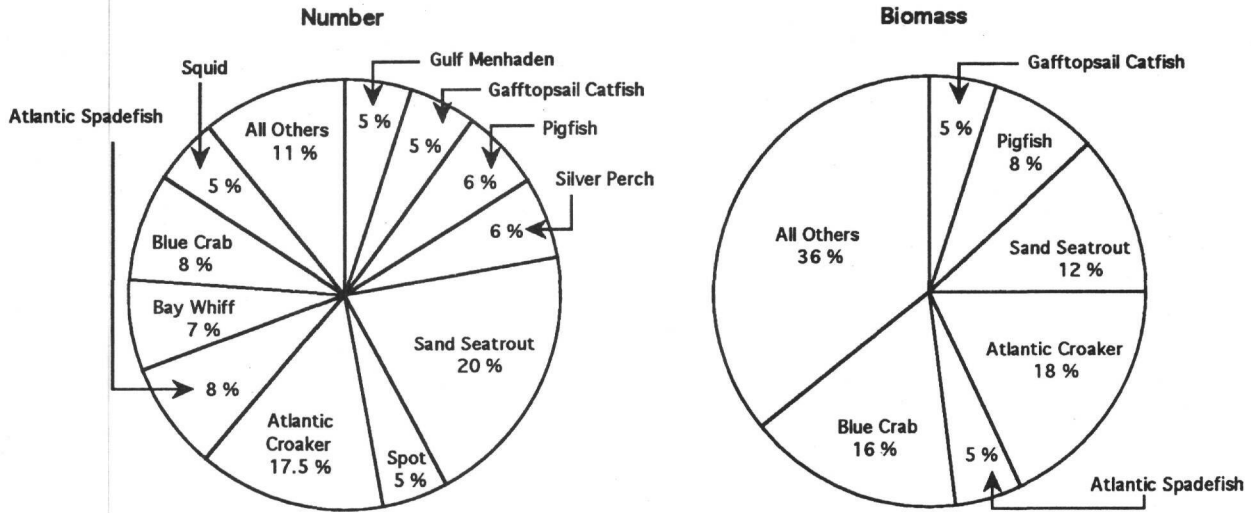


Figure 14. Percent of total bycatch (number and biomass) contributed by dominant fish and/or invertebrates during July and August 1981 (from Lamkin 1984).

# September 1981



# October 1981

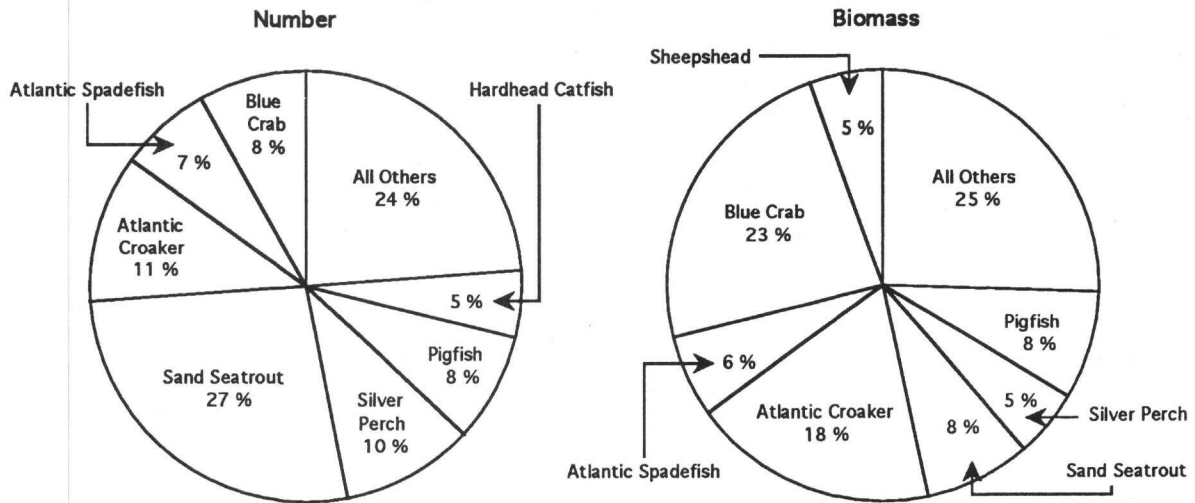
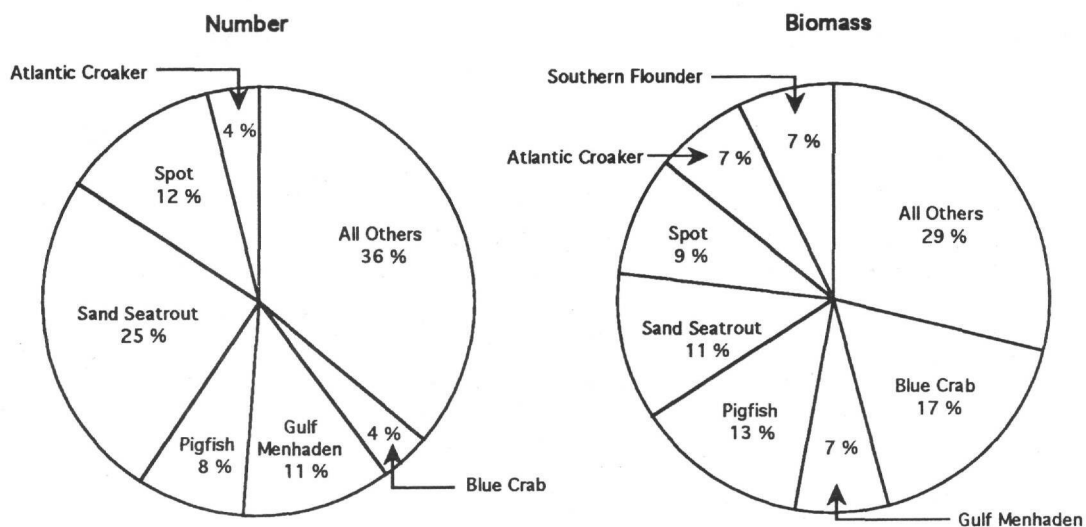


Figure 15. Percent of total bycatch (number and biomass) contributed by dominant fish and/or invertebrates during September and October 1981 (from Lamkin 1984).

# November 1981



# December 1981

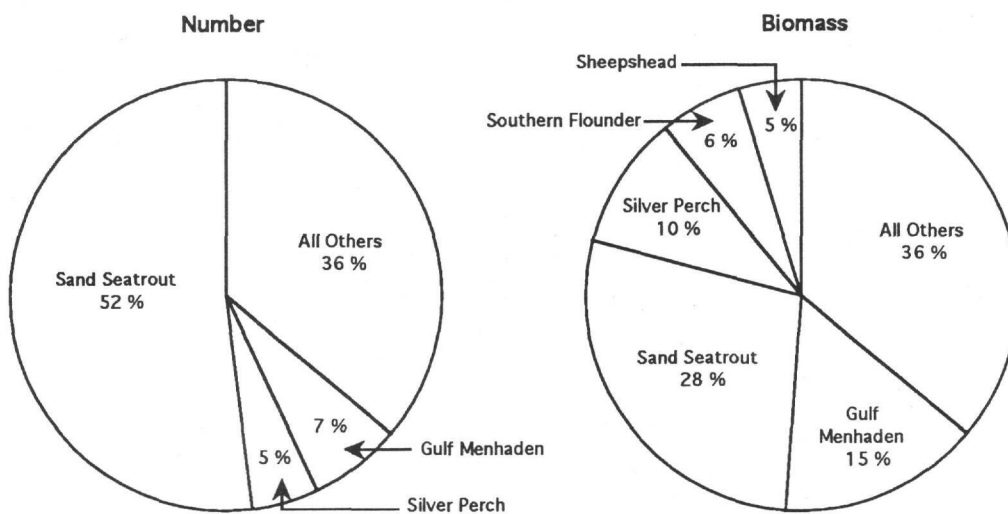
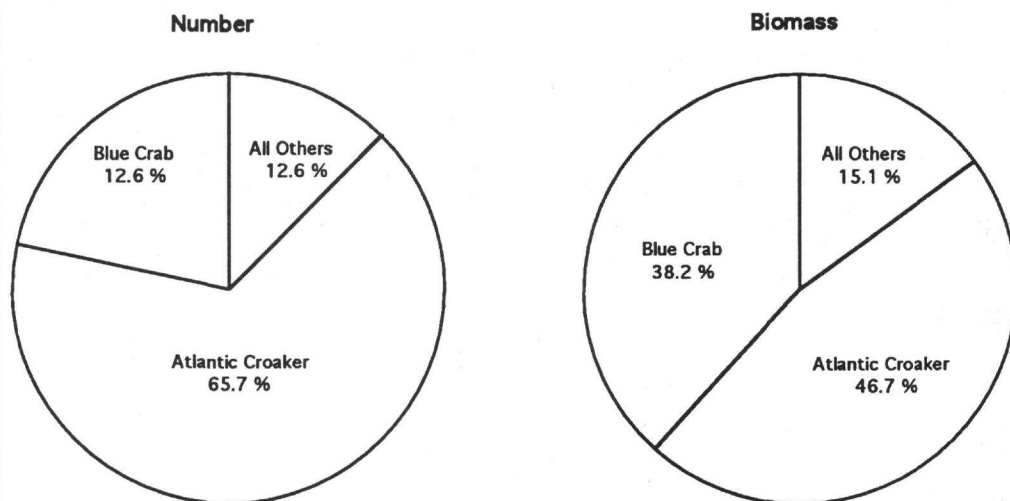


Figure 16. Percent of total bycatch (number and biomass) contributed by dominant fish and/or invertebrates during November and December 1981 (from Lamkin 1984).

May 1982



June 1982

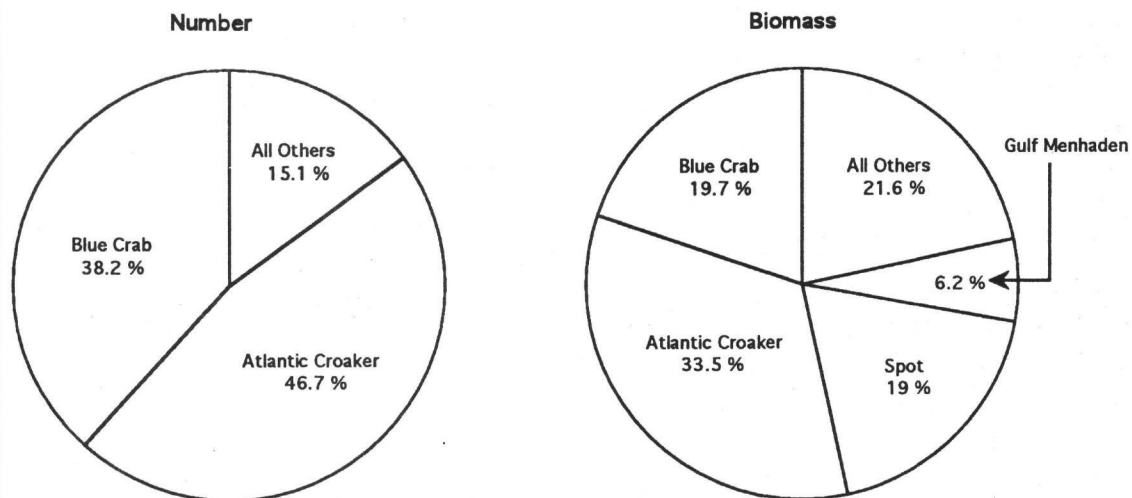


Figure 17. Percent of total bycatch (number and biomass) contributed by dominant fish and/or invertebrates during May and June 1982 (from Lamkin 1984).

**Table 1: Temperature and salinity in Galveston Bay sampling areas during 1981-82 (from Lamkin 1984).**

Sampling Area	Date	Temp. (°C)	Salinity (ppt)
West Bay	Jul-04	28.0	15
West Bay	Jul-08	26.0	14
West Bay	Jul-10	28.5	15
West Bay	Jul-16	30.0	22
Offatts Bayou	Jul-22	29.0	19
West Bay	Aug-01	29.0	20
West Bay	Aug-09	32.0	19
Offatts Bayou	Aug-19	32.0	18
Offatts Bayou	Aug-21	28.0	16
West Bay	Sep-02	26.0	16
West Bay	Sep-05	28.0	18
West Bay	Sep-08	28.0	19
West Bay	Sep-11	26.0	20
West Bay	Sep-18	25.0	16
West Bay	Sep-22	26.0	17
West Bay	Sep-29	27.0	19
West Bay	Oct-02	27.0	21
West Bay	Oct-09	25.0	22
West Bay	Oct-16	25.0	19
West Bay	Oct-27	18.5	15
West Bay	Oct-29	19.5	17
West Bay	Nov-06	21.0	22
West Bay	Nov-12	16.0	17
Lower Galveston Bay	Nov-19	16.5	17
Lower Galveston Bay	Dec-03	18.0	19
Lower Galveston Bay	Dec-11	18.5	20
Lower Galveston Bay	Dec-16	14.0	19
Lower Galveston Bay	Dec-31	11.0	16
West Bay	May-12	24.5	16
West Bay	May-17	26.0	16
West Bay	May-23	26.0	16
West Bay	Jun-01	28.0	17
West Bay	Jun-10	28.0	18
West Bay	Jun-24	30.0	16

**Table 2: Biomass and percentage of total catch for bait shrimp and bycatch taken from Galveston Bay during July 1981 through June 1982 (from Lamkin 1984).**

<b>Month</b>	<b>Shrimp Biomass (kg)</b>	<b>% of Catch</b>	<b>Bycatch (kg)</b>	<b>% of Catch</b>
Jul-81	166.6	81.3	38.4	18.7
Aug-81	44.0	57.6	32.5	42.4
Sep-81	124.4	58.0	90.2	42.0
Oct-81	166.3	80.2	41.0	19.8
Nov-81	46.2	67.4	22.3	32.6
Dec-81	115.6	83.1	23.5	16.9
May-82	178.5	73.6	64.1	26.4
Jun-82	190.5	81.0	44.7	19.0
Average	129.0	72.8	44.6	27.2

**Table 3: Monthly catch of southern flounder by commercial shrimp vessels in various areas of Galveston Bay (data from Matlock, 1982).**

Month	Bay Area	# of Southern Flounder	Flounder / Hr. ± 1 S.E.	# Tows	Total Tow Time (Hrs.)
April	Bastrop Bayou	2	1.0±1.0	9	2.1
May	Moses Lake; Galveston	3	0.7±0.5	6	4.4
June	Trinity	27	19.3±5.4	4	1.4
July	Galveston	0	0	2	1.8
August	Clear Lake	5	1.2±0.9	3	4
September	Galveston	0	0	3	1.5
October	Trinity	2	0.4±0.5	4	4.5
November	Clear Lake	0	0	3	3.6
April-November	All Areas	39	1.7±1.2	34	23.3

**Table 4: Baywide frequency of fishes, May-November 1984 (data from Bessette, 1985).**

**Common names follow guidelines for taxonomic nomenclature set forth in American Fisheries Society Special Publications (Turgeon et al. 1988, Williams et al. 1988, Robins et al. 1991). Scientific names listed in Appendix 1.**

<b>Species</b>	<b># of Tows</b>	<b>Mean CPUE</b>	<b>Mean Wt. (grams)</b>	<b>Total Wt. (Kg.)</b>
Atlantic Croaker	107	18.7	14.1	506.33
Spot	105	7.4	12.9	246.92
Gulf Menhaden	99	14.3	16.7	394.27
Sand Seatrout	92	2.3	20.9	73.55
Least Puffer	63	0.7	5.5	9.32
Pinfish	61	2.4	23.9	47.44
Threadfin Shad	58	2.8	16.0	69.57
Bay Whiff	57	0.6	6.5	13.58
Bay Anchovy	51	0.2	1.3	4.72
Atlantic Threadfin	48	0.9	14.6	9.29
Harhead Catfish	40	5.8	17.4	68.46
Cutlassfish	40	3.8	40.6	56.62
Inshore Lizardfish	38	1.3	25.8	23.48
Silver Perch	37	0.7	23.2	10.59
Striped Mullet	37	3.8	50.8	41.91
Gafftopsail Catfish	34	3.1	25.8	34.57
Gulf Butterfish	29	1.6	22.5	15.28
Bighead Searobin	29	0.8	37.9	7.38
Atlantic Spadefish	28	0.4	13.2	4.58
Southern Flounder	28	2.5	42.5	22.61
Harvestfish	25	2.2	58.2	15.17
Fringed Flounder	22	1.2	7.9	12.45
Pigfish	20	0.8	43.6	7.22
Spanish Mackerel	19	1.0	27.9	6.78
Crevalle Jack	17	0.4	16.7	2.29
Atlantic Midshipman	15	0.2	17.6	1.04
Striped Anchovy	13	0.2	7.4	0.79
Gulf Toadfish	12	0.5	30.9	1.33
Black Drum	10	3.3	65.6	6.14
Lookdown	10	0.3	7.5	1.85
Atlantic Bumper	8	0.4	5.4	2.04
Blackcheek Tonguefish	8	0.3	10.5	1.20
Finescale Menhaden	7	0.9	48.4	1.18
Rock Sea Bass	7	0.7	28.5	2.60
Southern Kingfish	7	1.0	54.0	1.85
Spotted Seatrout	6	0.5	18.6	0.85

**Table 4 (continued):**

<b>Species</b>	<b># of Tows</b>	<b>Mean CPUE</b>	<b>Mean WT. (grams)</b>	<b>Total Wt. (Kg.)</b>
Bluntnose Jack	6	0.3	14.5	0.64
Gulf Kingfish	6	1.5	77.5	2.56
Ocellated Flounder	5	1.3	67.9	1.67
Bluespotted Searobin	5	0.2	10.8	0.21
Hogchocker	4	0.3	38.6	0.47
Gizzard Shad	3	1.6	25.7	1.30
Silver Jenny	3	0.2	12.2	0.28
Leatherjack	3	0.1	8.5	0.08
Sheephead	2	0.5	43.3	0.35
Striped Burrfish	2	0.1	7.5	0.06
Atlantic Stingray	2	1.2	90.4	0.52
Scaled Sardine	2	0.1	4.2	0.05
Pygmy Filefish	2	0.1	2.9	0.07
Atlantic Thread Herring	2	0.2	5.8	0.13
Blackwing Searobin	3	0.2	17.1	0.24
Moonfish	2	0.0	2.0	0.02
Bearded Brotula	1	1.9	116.6	1.71
Ladyfish	1	0.5	40.7	0.11
Skilletfish	1	0.2	6.3	0.05
Highfin Goby	1	0.1	3.7	0.03
Freckled Blenny	1	0.2	18.2	0.08
Rough Silverside	1	0.1	5.6	0.03
Inland Silverside	1	0.0	3.1	0.01
Shrimp Eel	1	2.3	167.5	0.56
Bluefish	1	0.6	139.7	0.14
Florida Pompano	1	0.2	33.2	0.06

**Table 5: Baywide bycatch species percentage by biomass and number (data from Bessette, 1985). Common names follow guidelines set forth in American Fisheries Society standards (Turgeon et al. 1988, Williams et al. 1988, Robins et al. 1991). Scientific names are provided in Appendix 1.**

Common Name	Species Weight		Species Number	
	Total Kg.	%	Total	%
Lined Sole	0.22	0.01	67	0.1
Striped Anchovy	0.79	0.04	92	0.1
Bay Anchovy	4.72	0.25	4535	4.1
Ocellated Flounder	1.67	0.09	24	<0.1
Sheepshead	0.35	0.02	8	<0.1
Speckled Crab	0.88	0.05	17	<0.1
Hardhead Catfish	68.50	3.60	3650	3.3
Southern Stargazer	6.47	0.34	44	<0.1
Gafftopsail Catfish	34.57	1.84	1999	1.8
Silver Perch	10.59	0.56	410	0.4
Finescale Menhaden	1.18	0.06	34	<0.1
Gulf Menhaden	394.27	21.01	25544	23.2
Bearded Brotula	1.71	0.09	14	<0.1
Blue Crab	74.89	3.99	2154	2.0
Lesser Blue Crab	4.15	0.22	221	0.2
Creville Jack	2.29	0.12	109	0.1
Rock Sea Bass	2.60	0.14	75	0.1
Atlantic Spadefish	4.58	0.24	359	0.3
Striped Burrfish	0.06	<.01	7	<0.1
Atlantic Bumper	2.04	0.11	440	0.4
Bay Whiff	13.58	0.72	1392	1.3
Green Snapping Shrimp	0.04	<.01	26	<0.1
Sand Seatrout	73.55	3.92	4474	4.1
Spotted Seatrout	0.85	0.05	36	<0.1
Silver Seatrout	0.83	0.04	36	<0.1
Atlantic Stingray	0.52	0.03	5	<0.1
Gizzard Shad	1.30	0.07	44	<0.1
Threadfin Shad	69.57	3.71	3280	3.0
Ladyfish	0.11	0.01	2	<0.1
Fringed Flounder	12.45	0.66	1467	1.3
Silver Jenny	0.28	0.01	22	<0.1
Skilletfish	0.05	<.01	7	<0.1
Highfin Goby	0.03	<.01	7	<0.1
Scaled Sardine	0.05	<.01	10	<0.1
Bluntnose Jack	0.64	0.03	39	<0.1
Freckled Blenny	0.08	<.01	4	<0.1
Pinfish	47.44	2.53	2215	2.0

**Table 5 (continued):**

Common Name	Species Weight		Species Number	
	Total Kg.	%	Total	%
Spot	246.92	13.16	14857	13.5
Atlantic Brief Squid	47.89	2.55	3366	3.1
Rough Silverside	0.03	<.01	5	<0.1
Inland Silverside	0.01	<.01	2	<0.1
Southern Kingfish	1.85	0.10	28	<0.1
Gulf Kingfish	2.56	0.14	34	<0.1
Atlantic Croaker	506.33	26.98	29690	27.0
Pygmy Filefish	0.07	<.01	17	<0.1
Striped Mullet	41.91	2.23	840	0.8
Leatherjacket	0.08	<.01	12	<0.1
Shrimp Eel	0.56	0.03	3	<0.1
Atlantic Thread Herring	0.13	0.01	17	<0.1
Gulf Toadfish	1.33	0.07	31	<0.1
Pigfish	7.22	0.38	195	0.2
Southern Flounder	22.61	1.20	315	0.3
Gulf Butterfish	15.28	0.81	717	0.7
Harvestfish	15.17	0.81	230	0.2
Black Drum	6.14	0.33	85	0.1
Atlantic Threadfin	9.29	0.50	804	0.7
Bluefish	0.14	0.01	1	<0.1
Atlantic Midshipman	1.04	0.06	66	0.1
Iridescent Swimming Crab	1.19	0.06	103	0.1
Bluespotted Sea Robin	0.21	0.01	16	<0.1
Blackwing Sea Robin	0.24	0.01	12	<0.1
Bighead Sea Robin	7.38	0.39	194	0.2
Spanish Mackerel	6.78	0.36	191	0.2
Atlantic Moonfish	0.02	<.01	9	<0.1
Lookdown	1.85	0.10	345	0.3
Rock Shrimp	0.23	0.01	192	0.2
Least Puffer	9.32	0.50	1697	1.5
Mantis Shrimp	1.58	0.08	121	0.1
Star Drum	1.73	0.09	151	0.1
Blackcheek Tonguefish	1.20	0.06	78	0.1
Inshore Lizardfish	23.48	1.25	936	0.9
Florida Pompano	0.06	<.01	1	<0.1
Atlantic Cutlassfish	56.62	3.02	1733	1.6
Hogchoker	0.47	0.03	2	<0.1
All Species	1876.77	100.00	109983	100.0

**Table 6: Occurrence of fish by species and bay area (data from Bessette 1985). Common names follow American Fisheries Society guidelines (Turgeon et al. 1988, Williams et al. 1988, Robins et al. 1991). Scientific names are provided in Appendix 1.**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>TRINITY BAY</b>						
Atlantic Croaker	20	10.4	112.22	42.71	6022	35.4
Gulf Menhaden	20	4.6	26.08	9.93	4692	27.6
Spot	20	9.7	35.93	13.67	1801	10.6
Hardhead Catfish	9	12.9	29.22	11.12	1039	6.1
Sand Seatrout	16	7.8	9.17	3.49	899	5.3
Least Puffer	15	4.9	4.05	1.54	671	3.9
Bay Whiff	6	6.5	6.94	2.64	482	2.8
Gafftopsail Catfish	6	14.0	5.09	1.94	475	2.8
Threadfin Shad	10	8.3	1.94	0.74	254	1.5
Southern Flounder	7	54.9	18.40	7.00	205	1.2
Bay Anchovy	5	0.7	0.09	<0.1	128	0.8
Pinfish	7	42.0	3.78	1.44	96	0.6
Black Drum	5	85.8	4.42	1.68	49	0.3
Striped Mullet	4	71.1	2.52	0.96	33	0.2
Spotted Seatrout	3	15.1	0.38	0.15	17	0.1
Atlantic Threadfin	5	21.3	0.38	0.15	17	0.1
Bighead Searobin	3	40.8	0.41	0.16	17	0.1
Gizzard Shad	2	21.5	0.33	0.13	16	<0.1
Atlantic Thread Herring	1	8.1	0.12	<0.1	14	<0.1
Striped Anchovy	3	6.7	0.10	<0.1	13	<0.1
Finescale Menhaden	2	8.5	0.12	<0.1	13	<0.1
Silver Perch	4	11.0	0.16	<0.1	12	<0.1
Atlantic Spadefish	2	6.0	0.04	<0.1	10	<0.1
Fringed Flounder	1	3.3	0.03	<0.1	9	<0.1
Lined Sole	1	1.0	0.01	<0.1	7	<0.1
Skilletfish	1	6.3	0.05	<0.1	7	<0.1
Leatherjack	1	1.7	0.01	<0.1	7	<0.1
Inshore Lizardfish	1	51.9	0.38	0.2	7	<0.1
Cutlassfish	1	30.0	0.19	<0.1	6	<0.1
Sheephead	1	54.8	0.14	<0.1	2	<0.1
Silver Jenny	1	19.1	0.03	<0.1	1	<0.1
Blackwing Searobin	1	1.1	0.00	<0.1	1	<0.1
Star Drum	1	19.3	0.03	<0.1	1	<0.1
Totals for All Species			262.77	100.0	17023	100.0

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>UPPER GALVESTON BAY</b>						
Atlantic Croaker	16	10.6	138.44	53.9	6789	39.3
Gulf Menhaden	16	6.5	50.93	19.8	6323	36.6
Hardhead Catfish	9	40.1	24.29	9.5	1428	8.3
Spot	16	12.4	12.78	5.0	995	5.8
Sand Seatrout	14	26.9	12.56	4.9	444	2.6
Least Puffer	14	3.0	1.15	0.4	349	2.0
Gafftopsail Catfish	7	22.7	2.23	0.9	218	1.3
Threadfin Shad	8	17.6	3.49	1.4	192	1.1
Atlantic Threadfin	10	14.1	1.67	0.6	136	0.8
Bay Whiff	8	6.8	0.86	0.3	130	0.8
Bay Anchovy	7	1.2	0.10	<0.1	100	0.6
Pinfish	1	30.1	0.92	0.4	30	0.2
Harvestfish	3	127.8	3.05	1.2	29	0.2
Atlantic Spadefish	1	11.9	0.18	<0.1	15	<0.1
Inshore Lizardfish	4	18.0	0.33	0.1	15	<0.1
Finescale Menhaden	3	45.1	0.69	0.3	13	<0.1
Black Drum	1	60.5	0.62	0.2	10	<0.1
Striped Anchovy	2	7.7	0.07	<0.1	8	<0.1
Southern Kingfish	1	110.9	0.88	0.3	7	<0.1
Bighead Searobin	1	8.6	0.07	<0.1	7	<0.1
Lined Sole	1	0.9	0.01	<0.1	6	<0.1
Gulf Toadfish	1	56.3	0.38	0.1	6	<0.1
Silver Perch	1	7.7	0.04	<0.1	5	<0.1
Spotted Seatrout	1	21.5	0.07	<0.1	3	<0.1
Atlantic Stingray	1	81.3	0.28	0.1	3	<0.1
Southern Flounder	1	84.3	0.29	0.1	3	<0.1
Blackcheek Tonguefish	1	8.7	0.03	<0.1	3	<0.1
Southern Stargazer	1	85.7	0.22	<0.1	2	<0.1
Crevalle Jack	1	3.1	0.01	<0.1	2	<0.1
Ladyfish	1	40.7	0.11	<0.1	2	<0.1
Fringed Flounder	1	2.0	0.01	<0.1	2	<0.1
Striped Mullet	1	20.2	0.05	<0.1	2	<0.1
Spanish Mackerel	1	47.9	0.12	<0.1	2	<0.1
Atlantic Midshipman	1	25.0	0.05	<0.1	1	<0.1
Totals for All Species			256.95	100.0	17280	100.0

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>WEST BAY</b>						
Atlantic Croaker	16	16.9	37.25	30.9	3064	39.6
Spot	15	11.4	12.22	10.1	1296	16.7
Gulf Menhaden	9	57.2	13.87	11.5	820	10.6
Gafftopsail Catfish	6	17.9	12.65	10.5	688	8.9
Pinfish	13	15.7	7.34	6.1	599	7.7
Cutlassfish	11	45.5	17.50	14.5	455	5.9
Sand Seatrout	12	15.4	3.59	3.0	197	2.5
Atlantic Spadefish	11	18.9	2.40	2.0	127	1.6
Pigfish	9	30.3	2.53	2.1	110	1.4
Bay Whiff	8	8.9	0.53	0.4	59	0.8
Silver Perch	7	22.8	0.98	0.8	49	0.6
Bay Anchovy	5	1.6	0.07	<0.1	43	0.6
Gulf Butterfish	6	21.9	0.99	0.8	38	0.5
Least Puffer	8	7.7	0.24	0.2	34	0.4
Atlantic Threadfin	4	8.5	0.29	0.2	30	0.4
Harvestfish	4	83.5	2.81	2.3	25	0.3
Atlantic Midshipman	8	11.9	0.23	0.2	23	0.3
Spanish Mackerel	3	50.0	1.02	0.8	12	0.2
Gulf Toadfish	7	25.8	0.48	0.4	11	0.1
Inshore Lizardfish	3	43.3	0.67	0.6	11	0.1
Threadfin Shad	3	19.7	0.22	0.2	9	0.1
Southern Flounder	4	31.4	0.42	0.3	9	0.1
Striped Mullet	2	120.0	0.89	0.7	8	0.1
Fringed Flounder	3	9.1	0.07	<0.1	6	<0.1
Bighead Searobin	4	64.4	0.78	0.6	5	<0.1
Hardhead Catfish	3	25.9	0.15	0.1	4	<0.1
Lined Sole	1	2.2	0.01	<0.1	3	<0.1
Black Drum	1	42.4	0.15	0.1	3	<0.1
Blackcheek Tonguefish	2	1.9	0.00	<0.1	1	<0.1
Hogchoker	1	105.7	0.16	<0.1	1	<0.1
Lookdown	1	0.0	0.00	<0.1	0	<0.1
Totals for All Species			120.53	100.0	7740	100.5

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>LOWER GALVESTON BAY</b>						
Atlantic Croaker	21	22.6	123.88	24.7	4630	20.8
Gulf Menhaden	21	19.8	126.58	25.2	3504	15.7
Spot	20	16.6	35.54	7.1	1852	8.3
Sand Seatrout	21	30.6	30.14	6.0	1534	6.9
Bay Anchovy	11	1.3	1.66	0.3	1519	6.8
Threadfin Shad	14	15.1	40.00	8.0	1473	6.6
Fringed Flounder	11	7.9	9.23	1.8	1117	5.0
Cutlassfish	13	37.9	25.31	5.0	939	4.2
Inshore Lizardfish	15	22.7	18.40	3.7	765	3.4
Pinfish	15	25.5	15.56	3.1	748	3.4
Bay Whiff	17	7.7	4.34	0.9	552	2.5
Hardhead Catfish	9	9.6	12.67	2.5	511	2.3
Atlantic Bumper	5	7.3	1.93	0.4	388	1.7
Atlantic Threadfin	12	21.7	5.26	1.0	379	1.7
Gulf Butterfish	12	23.6	7.50	1.5	370	1.7
Least Puffer	11	5.3	2.04	0.4	357	1.6
Lookdown	4	11.7	1.35	0.3	251	1.1
Silver Perch	7	25.2	4.24	0.8	168	0.8
Star Drum	2	11.0	1.53	0.3	143	0.6
Spanish Mackerel	6	26.7	4.02	0.8	121	0.5
Atlantic Spadefish	8	12.3	0.86	0.2	98	0.4
Rock Sea Bass	7	28.5	2.60	0.5	75	0.3
Striped Mullet	3	52.0	5.76	1.1	74	0.3
Harvestfish	7	19.3	1.33	0.3	73	0.3
Bighead Searobin	7	30.9	2.07	0.4	60	0.3
Lined Sole	1	3.8	0.20	<0.1	51	0.2
Blackcheek Tonguefish	2	16.4	0.84	0.2	50	0.2
Striped Anchovy	5	8.2	0.46	<0.1	46	0.2
Southern Stargazer	3	105.1	6.25	1.2	42	0.2
Crevalle Jack	5	15.9	0.62	0.1	42	0.2
Silver Seatrout	3	21.7	0.75	0.2	34	0.2
Bluntnose Jack	4	19.7	0.61	0.1	34	0.2
Gafftopsail Catfish	4	32.0	1.02	0.2	29	0.1
Atlantic Midshipman	3	23.7	0.45	<0.1	21	<0.1
Ocellated Flounder	4	61.8	1.15	0.2	19	<0.1
Pigfish	5	44.5	0.71	0.1	19	<0.1
Hogchoker	3	16.2	0.31	<0.1	19	<0.1
Gulf Toadfish	4	33.5	0.46	<0.1	14	<0.1
Southern Flounder	5	74.4	1.28	0.3	14	<0.1
Spotted Seatrout	1	23.9	0.31	<0.1	12	<0.1
Gulf Kingfish	1	35.0	0.45	<0.1	12	<0.1
Pygmy Filefish	1	4.7	0.06	<0.1	12	<0.1
Bluespotted Searobin	4	11.7	0.17	<0.1	12	<0.1

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>LOWER GALVESTON BAY (cont.)</b>						
Southern Kingfish	4	46.0	0.60	0.1	11	<0.1
Finescale Menhaden	1	17.4	0.13	<0.1	7	<0.1
Striped Burrfish	2	7.5	0.06	<0.1	7	<0.1
Highfin Goby	1	3.7	0.03	<0.1	7	<0.1
Sheephead	1	31.9	0.21	<0.1	6	<0.1
Scaled Sardine	1	5.4	0.03	<0.1	6	<0.1
Rough Silverside	1	5.6	0.03	<0.1	5	<0.1
Silver Jenny	1	5.3	0.03	<0.1	4	<0.1
Freckled Blenny	1	18.2	0.08	<0.1	4	<0.1
Blackwing Searobin	1	46.5	0.21	<0.1	4	<0.1
Moonfish	1	2.9	0.01	<0.1	4	<0.1
Leatherjack	1	15.0	0.05	<0.1	3	<0.1
Atlantic Thread Herring	1	3.5	0.01	<0.1	3	<0.1
Atlantic Stingray	1	99.5	0.25	<0.1	2	<0.1
Florida Pompano	1	33.2	0.06	<0.1	1	<0.1
Totals for All Species			501.70	100.0	22257	100.0

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>FAR WEST AND CHOCOLATE BAY</b>						
Spot	22	15.6	131.26	30.1	6241	25.4
Gulf Menhaden	22	18.8	104.40	24.0	5917	24.0
Atlantic Croaker	22	10.8	65.28	15.0	5163	21.0
Bay Anchovy	16	1.5	1.85	0.4	1619	6.6
Sand Seatrout	19	25.1	16.82	3.9	1285	5.2
Threadfin Shad	13	19.3	18.27	4.2	915	3.7
Pinfish	15	20.5	16.50	3.8	645	2.6
Gafftopsail Catfish	8	38.5	12.10	2.8	517	2.1
Striped Mullet	18	44.3	18.32	4.2	396	1.6
Cutlassfish	11	31.5	10.56	2.4	254	1.0
Gulf Butterfish	7	20.8	4.20	1.0	196	0.8
Silver Perch	17	26.7	5.15	1.2	174	0.7
Least Puffer	6	13.5	1.21	0.3	126	0.5
Atlantic Threadfin	11	10.2	0.87	0.2	111	0.5
Bay Whiff	11	4.6	0.64	0.1	106	0.4
Fringed Flounder	2	7.1	0.68	0.2	98	0.4
Hardhead Catfish	5	3.4	0.41	<0.1	95	0.4
Bighead Searobin	10	30.6	2.32	0.5	90	0.4
Harvestfish	7	84.0	7.92	1.8	89	0.4
Lookdown	3	5.4	0.42	0.1	81	0.3
Southern Flounder	10	22.1	2.22	0.5	79	0.3
Inshore Lizardfish	8	31.1	2.36	0.5	67	0.3
Atlantic Spadefish	4	7.5	0.64	0.1	55	0.2
Pigfish	5	50.4	2.41	0.6	54	0.2
Spanish Mackerel	5	19.5	1.47	0.3	48	0.2
Crevale Jack	7	21.7	1.37	0.3	44	0.2
Gulf Kingfish	5	86.0	2.11	0.5	22	<0.1
Blackcheek Tonguefish	2	9.9	0.29	<0.1	22	<0.1
Atlantic Midshipman	3	24.1	0.31	<0.1	21	<0.1
Atlantic Bumper	1	4.0	0.07	<0.1	17	<0.1
Silver Jenny	1	12.3	0.22	<0.1	17	<0.1
Striped Anchovy	2	6.2	0.08	<0.1	14	<0.1
Bearded brotula	1	116.6	1.71	0.4	14	<0.1
Moonfish	1	1.1	0.01	<0.1	5	<0.1
Southern Kingfish	1	68.8	0.28	<0.1	4	<0.1
Bluespotted Searobin	1	7.5	0.04	<0.1	4	<0.1
Shrimp Eel	1	167.5	0.56	0.1	3	<0.1
Silver Seatrout	1	24.5	0.07	<0.1	2	<0.1
Finescale Menhaden	1	169.0	0.23	<0.1	1	<0.1
Totals for All Species			435.63	100.0	24611	100.0

**Table 6 (continued):**

Species	Tows (#)	Mean Wt. (grams)	Total Wt. (Kg.)	Percent By Weight	# Fish Caught	Percent By Number
<b>EAST BAY</b>						
Gulf Menhaden	11	10.2	72.40	43.0	4288	28.8
Atlantic Croaker	12	11.9	29.25	17.4	4022	27.0
Spot	12	9.4	19.19	11.4	2672	18.0
Bay Anchovy	7	0.8	0.95	0.6	1126	7.6
Hardhead Catfish	5	7.4	1.72	1.0	573	3.9
Threadfin Shad	10	18.1	5.64	3.3	437	2.9
Striped Mullet	9	42.3	14.37	8.5	327	2.2
Fringed Flounder	4	10.1	2.44	1.4	235	1.6
Least Puffer	9	3.0	0.62	0.4	160	1.1
Atlantic Threadfin	6	7.7	0.82	0.5	131	0.9
Sand Seatrout	10	11.7	1.27	0.8	115	0.8
Gulf Butterfish	4	23.1	2.58	1.5	113	0.8
Pinfish	10	23.9	3.35	2.0	97	0.7
Cutlassfish	4	63.8	3.07	1.8	79	0.5
Gafftopsail Catfish	3	30.1	1.49	0.9	72	0.5
Inshore Lizardfish	7	20.0	1.33	0.8	71	0.5
Bay Whiff	7	3.9	0.28	0.2	63	0.4
Atlantic Spadefish	2	5.7	0.46	0.3	54	0.4
Atlantic Bumper	2	1.1	0.04	<0.1	35	0.2
Gizzard Shad	1	34.1	0.96	0.6	28	0.2
Black Drum	3	41.3	0.95	0.6	23	0.2
Crevalle Jack	4	12.4	0.29	0.2	21	0.1
Bighead Searobin	4	47.0	1.74	1.0	15	0.1
Harvestfish	4	3.6	0.06	<0.1	14	<0.1
Lookdown	2	6.2	0.08	<0.1	13	<0.1
Pigfish	1	125.3	1.57	0.9	12	<0.1
Striped Anchovy	1	7.0	0.08	<0.1	11	<0.1
Spanish Mackerel	4	18.5	0.15	<0.1	8	<0.1
Blackwing Searobin	1	3.7	0.03	<0.1	7	<0.1
Star Drum	1	23.9	0.17	0.1	7	<0.1
Southern Kingfish	1	14.5	0.09	<0.1	6	<0.1
Ocellated Flounder	1	92.5	0.51	0.3	5	<0.1
Bluntnose Jack	2	4.2	0.02	<0.1	5	<0.1
Pygmy Filefish	1	1.1	0.01	<0.1	5	<0.1
Southern Flounder	1	2.5	0.01	<0.1	5	<0.1
Spotted Seatrout	1	20.8	0.09	<0.1	4	<0.1
Scaled Sardine	1	2.9	0.01	<0.1	4	<0.1
Silver Perch	1	17.3	0.04	<0.1	2	<0.1
Inland Silverside	1	3.1	0.01	<0.1	2	<0.1
Leatherjack	1	8.7	0.02	<0.1	2	<0.1
Blackcheek Tonguefish	1	18.8	0.04	<0.1	2	<0.1
Inland Silverside	1	139.7	0.14	<0.1	1	<0.1
Totals for All Species	12		168.35	100.0	14872	100.0

**Table 7: Baywide frequency of invertebrates, May-November 1984 (data from Bessette 1985).**

Species	# of Tows	Mean CPUE	Mean WT. (grams)	Total Wt. (Kg.)
Blue Crab	56	7.50	53.5	74.90
Atlantic Brief Squid	47	2.70	15.9	47.90
Mantis Shrimp	8	0.38	12.0	1.60
Iridescent Swimming Crab	8	0.38	12.9	1.20
Lesser Blue Crab	7	1.00	24.7	4.20
Rock Shrimp	7	0.07	1.1	0.20
<i>Crangon normanni</i> <sup>2</sup>	2	0.05	1.8	0.04
Speckled Swimming Crab	1	1.10	51.5	0.88

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<sup>2</sup> Bessette (1986) reported the occurrence of a crangon shrimp (*Crangon normanni*) which is presumably an erroneous identification or classification of the Green Snapping Shrimp (*Alpheus normanni*). No listing is available for *C. normanni* in Williams et al. (1988) which is used as the primary reference for taxonomic nomenclature of crustaceans in this study.

**Table 8: Average monthly shrimp:fish ratios and associated 95% confidence intervals ( $\pm t.05$  standard deviation) calculated from log (ln) transformed data (from Lamkin 1984).**

Month	-t.05	Mean Ratio	+t.05	Minimum Ratio	Maximum Ratio	n
Jul-81	3.3	6.4:1	12.2	1.2:1	37.8:1	10
Aug-81	1.0	2.1:1	4.6	0.5:1	4.8:1	7
Sep-81	1.0	1.8:1	3.1	0.1:1	9.9:1	14
Oct-81	1.9	4.1:1	8.5	3.1:1	9.8:1	8
Nov-81	1.0	2.4:1	5.6	0.8:1	10.1:1	6
Dec-81	0.7	1.5:1	3.3	1.71:1	13.1:1	7
May-82	1.9	5.2:1	14.6	2.1:1	11.2:1	4
Jun-82	1.7	3.9:1	9.1	1.5:1	8.6:1	6
Overall	2.5	3.2:1	4.2			62